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ABSTRACT

The papers in this collection are the 15 best papers from the thirteenth International Conference on College Teaching and Learning. They represent a cross-section of nearly 300 presentations, selected by juried review from 40 submitted for consideration. The papers are: (1) "The Use of Hybrid Type Educational Digital Entities in University Education" (Panagiotes S. Anastasiades); (2) "The Use of Movies in Management Education, Since "Life Is Like a Box of Chocolates. You Never Know What You're Gonna Get" (Claudio Baccarani and Federico Brunetti); (3) "Debunking the Myths of Online Education" (Gerald D. Baumgardner); (4) "Active Learning with Online Context-Based Modules" (Arthur L. Buikema, Jr.); (5) "Moonsnail Project: Roles of Technology and Research in Learning Science" (Thor A. Hansen and Patricia H. Kelley); (6) "Linking Universities and K-12 through Design of Outdoor Learning Environments" (Mary Taylor Haque, Bernadette Longo, Deborah Johnson, Sonja Maki, Gina McLellan, Lolly Tai, and Barbara Weaver); (7) "Breaking Down Traditional Disciplinary Boundaries in the Classroom" (Mark H. Holmes); (8) "Creativity and Technology: Teaching the Psychology of Creativity at the Technically Oriented University" (Natalie I. Hughson); (9) "Teaching Hypertext through Poetry" (Christine A. Hult); (10) "Achieving Collaborative Advantage--An Evolving Paradigm" (Harry Lasher, Elke Leeds, Gary Roberts, and Steve Smalt); (11) "Interdisciplinary Problem-Based Learning: Linking Environmental Policy and Environmental Science" (Jean O. Melious and Devon A. Cancilla); (12) "Teaching and Researching Higher-Order Thinking in a Virtual Environment" (Joseph J. Pear); (13) "Implementing Peer Assessment To Enhance Teaching and Learning" (Atara Sivan); (14) "Recruitment, Selection, Training and Evaluation of Mentors for Online Learning" (Ronald C. Thomas, Jr.); and (15) "Online Interaction: Learning Communities in the Virtual Classroom" (James G. Van Belle). Each paper contains references. (SLD)

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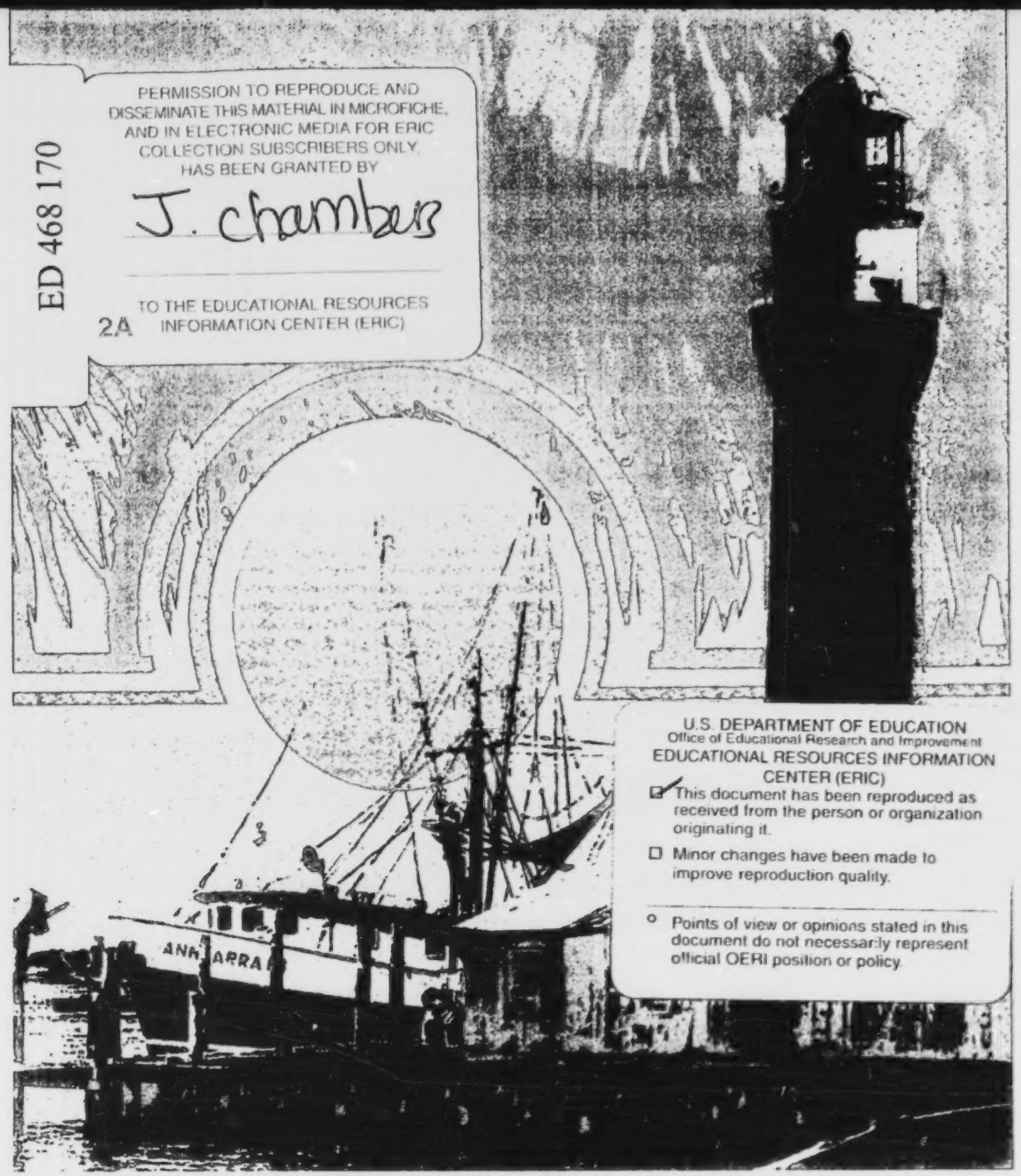

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SELECTED PAPERS from the 13th INTERNATIONAL CONFERENCE on COLLEGE TEACHING AND LEARNING

Edited by
Jack A. Chambers

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The Center
for the Advancement of
Teaching and Learning

SELECTED PAPERS
from the
13th INTERNATIONAL CONFERENCE
on
COLLEGE TEACHING AND LEARNING

Edited by
Jack A. Chambers

Florida Community College
at Jacksonville

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FOREWORD

The Center for the Advancement of Teaching and Learning was developed in 1987 when Florida Community College at Jacksonville accepted K. Patricia Cross' challenge to use the classroom as a modern laboratory for conducting experiments to gauge the impact of teaching on student learning.

The Center, with the philosophy that classroom teachers are the key to improving student learning, is composed of faculty members under the guidance of a steering committee which consists of faculty from each of the four major campuses of the College. Part of the Center's success can be attributed to the numerous opportunities given to faculty to test their teaching ideas and to put research results into practice.

Center Steering Committee members serve as Campus Online Mentors as well as sponsors of faculty development programs both College-wide and on each campus. The Center also supports faculty mini-grants for classroom research and professional development and sponsors a number of awards honoring teaching faculty. The Center itself has been the recipient of an award--the Theodore M. Hesburgh Certificate of Excellence--for its faculty development programs.

In an effort to stimulate creative discussion and promote experimentation to improve the teaching/learning process, as well as to honor those who have already significantly improved learning in higher education, the Center annually sponsors an international conference. The conference features recognized educational leaders in diverse areas of teaching, learning and technology. Since its inception, the conference has grown yearly and now

attracts a thousand scholars from around the world. This annual publication, *Selected Papers*, resulted from Center interest in honoring those faculty who develop some of the most outstanding contributions to the conference, as well as in preserving and making available these contributions to the teaching profession as a whole. *Selected Papers* is abstracted in ERIC and covered online by the American Psychological Association's PsycINFO.

Many people are responsible for the success of the conferences. Thanks to all participants--featured speakers and workshop leaders; presenters from universities, liberal arts and community colleges throughout the United States and abroad; faithful attendees; and Florida Community College faculty and staff who give so generously of their time and efforts each year to help the conference continue to improve its services.

Like the International Conference, this journal continues to grow and broaden its focus. This year's publication contains articles selected as the 15 best papers from the *Thirteenth International Conference on College Teaching and Learning* which represent a cross-section of the nearly 300 faculty presentations. More than 40 papers were submitted for consideration in this year's journal. Those that were selected for inclusion were juried by the Florida Community College faculty members listed below. Papers were judged on the following criteria:

*Quality of content

*Quality of writing and presentation

*Focus of the paper (i.e., teaching, learning, technology)

*Discipline

*Appeal to an audience of professional, post-secondary educators

*Theoretical or practical applications

We hope you will find the ideas presented here applicable and inspirational to your own teaching, learning and research. Please plan to join us at the *Fourteenth International Conference on College Teaching and Learning*, April 1-5, 2003, in Jacksonville.

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THE USE OF HYBRID TYPE EDUCATIONAL DIGITAL ENTITIES IN UNIVERSITY EDUCATION

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INTRODUCTION

The educational process represents the most important tool in the transformation towards the Information Society (Anastasiades, 2000a). Its role is to ensure that the citizens are provided with the necessary means to manage in a dynamic environment as represented by a rapidly changing world. The introduction of Web-based information and communication technologies into education (Dutton, 1996) significantly changes the structure and operation of education as it has been in the past.

Today, entire age groups are threatened by labor extinction if they do not adjust to the new circumstances within the shortest possible period of time. The demand for continuous adjustment to what is "new", is pushing an entire era to its limits, an era that tries with dismay to synchronize itself with the dictates of an entirely different reality. Universities are called upon to provide balance between the urgent demand of the labor market for graduates of specialized learning qualifications and the social necessity relating to the standard of man-scientist .

This paper will attempt to expound the idea and content of the hybrid type educational digital entity. The expectations and speculations arising from the introduction of the new educational model will then be discussed.

THE CONCEPT OF THE HYBRID DIGITAL EDUCATION ENTITY

The initial contact with the virtual aspect of human existence quite often results in fear and embarrassment, while raising many questions. Today, most people are now coming face to face with the concept of a machine which is becoming humanized, claiming more and more time and importance in our working and social endeavors in order to reduce the stress of everyday life and make life easier.

The term digital entity, which will be used throughout this paper, refers to the use of computer technology to create a virtual figure with human characteristics, which tries to imitate or substitute human existence itself in its various manifestations Anastasiades (2001). With the help of three dimensional graphics and advanced animation techniques, digital entities are part of a new environment, unknown until recently.

An educational digital entity, in essence the virtual representation of a teacher, undertakes a part of the teaching of scheduled courses. Initially, this could include teaching of the syllabus, with explanation of the most important points through discussion with the audience, as well as supervision and certification of the progress of students.

The digital educational entity could also serve as a substitute for the teacher as far as the teaching of certain courses is concerned, freeing him or her from the continuous repetitions of the same courses which have to be taught in multiple sections. At the same time it can ensure on a local, regional or national level, uniformity of style and context in regard to the syllabus.

At the end of the virtual teaching enough time will have to be provided so that the teacher can answer the questions that the students of the conventional class might

have, clarifying things, answering questions, encouraging and coordinating discussions etc.

As part of a comprehensive hybrid environment Anastasiades (2000b), the students can be connected--from the place of their choice through the Internet--with the digital entity at the time of their choice. At pre-selected intervals through teleconferences, students comprising the virtual class will be in contact with their teacher in order to have questions answered, to discuss concepts and issues, to present their work, or to be orally examined.

The technology used in the development of an educational digital entity, such as the techniques of digital representation-animation and digital image processing, could be used--in advanced form--in the case of an actual person, an existing human face, as well as in potential substitutes thereof, such as human-like, realistic figures. In this case, advanced techniques of "image metamorphosis"--image morphing (Watkins, Sadun, & Marenka, 1993)--can be used on actual faces in order to render the flow of expressions and words in a natural way.

The technological materialization of the whole undertaking can be supported, for example, by means of OpenGL application (Angel, 1999) for the processing and reproduction of the graphics, and the use of Microsoft text-to-speech API (Simon, Davis, Eaton, & Goetz, 1996) for the conversion of written text to oral, as well as other similar techniques. The end result will be the image of a human figure which, in the capacity of an instructor, can deliver the courses assigned to it, using even the appropriate facial expressions when the text contains "emoticons" such as :-), ;-) etc.

This type of technology is already in use, as a beginning, in the creation of human-like entities that will be used in the announcement of electronic messages [http://www.lifefx.com/FaceOfTheInternet/index.html]. A basic question that arises concerns the form and the content

of the educational digital entity, together with the mechanisms that will create it and will regularly check on its contribution to the educational process.

THOUGHTS AND PERSPECTIVES

There are many questions, which arise from the potential large-scale use of educational digital entities:

What will be the broader contribution of an absolutely controlled digital entity in the field of education?

How desirable is the existence of absolute uniformity of the way in which the teacher approaches the student on an educational level?

Could it be that the result of such an effort will be the leveling of any differences, and the abolition of the unique relation between a teacher and a student?

At this point it is important to point out that the teacher will be responsible for the entire educational procedure, answering the questions of the students in the virtual class, supervising their work and certifying their progress with the help of advanced technological methods and tools. Those who will allege in the near future that the digital educational entities will be the "personal assistants" of the teachers in a virtual school environment will not be few. Such assistants will rid faculty of today's necessity for continuous lecturing on the same courses to different classes, resulting in the faculty's main role changing from information disseminator to that of mentor who helps students critically analyze and understand the broad concepts of knowledge.

On the other hand, the creation of digital entities in the area of education turns many people's thoughts to an "Orwellean" environment—that the unique relationship between teacher and student is in danger of being overthrown by a human creation. And further, that this creation's knowledge will be pre-selected, its character will be programmed based on orders and codes, and its existence will depend upon the interconnection of the electronic circuits between them.

CONCLUSIONS

The digital entity aims at substituting one of the most important mainstays of a teacher's educational work--the repeated delivery of the same subject matter to different audiences (either conventional or virtual or hybrid). Such support releases the faculty member from the necessity of constant repetitions and the strain of covering the material to be taught, giving him or her time for discussion and speculation with his audience, securing an acceptable uniformity of material to be delivered at a local, regional or national level. Educators who feel uncomfortable at the prospect of such digital substitutes and who have placed themselves against the idea of a totally digital personality manufactured in the laboratories of a research center, are now called upon to reconsider and to accept and support the importance and usefulness of this approach.

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THE USE OF MOVIES IN MANAGEMENT EDUCATION, SINCE "LIFE IS LIKE A BOX OF CHOCOLATES. YOU NEVER KNOW WHAT YOU'RE GONNA GET"[1]

Claudio Baccarani
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INTRODUCTION

Guidelines, Applications and Contents of Management Education

As a starting point for the train of thought that is to be pursued, one can start from the fact that the management of any organization can be seen as a complex decision-making activity, and at the same time as the management of inter-subjective relationships, in which the artistic-intuitive contents are as important as the scientific-rational ones.

In this perspective, Celli (2001) found that the manager must possess a wide range of abilities, technical and specific, but also behavioral ones--without excluding the fact that there can be some traits of "geniality" almost comparable to those of an artist.

In fact, a manager not only has to have a knowledge of the operative know-how, being completely in control of the technical aspects of the activity for which s/he is

[1] The citation is from Robert Zemeckis' *Forrest Gump*, USA, 1994.

responsible, but s/he also has to know how to manage personal relationships with peers and with all other subjects s/he comes in contact with. S/he must also be able to face the evolution taking place in the specific area of action, thus creating a plausible vision of the future. As the manager climbs up the hierarchical ladder s/he must widen her/his horizons until s/he is able to interpret and draw conclusions on the surrounding environment.

Teaching management can thus mean several things--it can mean transferring knowledge of how to draw up and read a budget, of picking a distributive channel, of estimating how convenient an investment is--but it can also mean motivating people, resolving personal conflicts, outlining a strategy and many other activities that are difficult even to list.

Rullani (1989) and Guatri (1991) found that from an epistemological point of view the managerial disciplines are, thanks to their innate nature, partly positive and partly normative. In fact, they include a series of propositions that describe reality and a series of "rules of conduct" that provide behavior indications.

In this field it is not possible to teach a subject where the foundation consists entirely of a system of theoretical concepts, since management itself is essentially a problem solving activity, and real problems abound in the real world. The simple acquisition of practical knowledge would not, however, be sufficient in itself as the theoretical side has its own important and concrete role in terms of interpreting the real world (such as access to reality and the reading of it, the interpretation of facts and events, and reduction of complexity).

Thus, teaching management is not something in itself easy. Just trying to explain the concept in direct terms lets the reader immediately understand that s/he is facing a problem of no simple solution. First of all, it's about

defining what knowledge is to be transferred and then, last but not least, how to transmit it to others.

Thinking about the knowledge needed to run an organization and the art of teaching it is a quite complicated task. The matter gets even more complicated, proportionally speaking, if one considers what is going on in the surrounding environment. The impetuous globalization taking place in the economic and socio-cultural areas, the rapid transition going on in the productive systems, the revolutionary opportunities offered by the new information and communication technologies, the deep change of personal and collective values, are all factors that shape reality into completely new forms and make the current models of management obsolete.

The petitions being faced are pushing towards the rebasing of the method with which to lead business organizations. And it goes without saying that if the method has to change, so must the training of the people that have, or will have such a task. Moreover, education, at the university level in particular, should undertake a pioneer role in this changing process, thus putting itself at the head of the renewal process of the contents to teach and how to teach them.

Mintzberg (1989) and Drucker (1999) found that in these conditions of increasing dynamism and environmental complexity, the teaching of managerial subjects cannot be carried out simply by transferring the "laws" of management, or already-made "recipes" that are to be learned, or even worse, to be applied mechanically. According to Borgonovi (1998), it is always more evident that the teaching of managerial disciplines should not simply consist of a series of rules to be applied following the logic of "stimulus-answer" (a logic that takes into account the application of a certain kind of decision-making or behavioral model as a result of the actuation of a well-defined situation). On the other hand, the same

possibility of identifying a "well-defined" situation appears to be becoming more problematic due to the growing ambiguity and indeterminateness of reality.

Rullani (2001) found that the problem then takes on another perspective. First of all, it is based on the transmission-acquisition of the "exact" answer that is to be applied and on the formulation of conducts coherent with one's own resources and abilities. The teaching method should not only seek to transmit pre-prepared knowledge, but should also seek to make instruments and skills available to students to equip them to make their own independent interpretation of the world.

There should be increasingly more emphasis on teaching people to learn how to learn. The consolidated notions are certainly important--and creativity and intelligence can be developed only on a solid base of linguistic ability, analytical abilities and proper notions. But it is also important to acquire the ability to move in order to search for the informative sources necessary to construct and to keep updated one's cultural background.

On the other hand, Shoeck (1986) and Varanini (2000) found that it is becoming more frequent to pay more attention to a kind of education that is composed not only of a technical and scientific part, but also of a humanistic part. Even on a more international level, one can note an increasing use of the philosophical and literary classics (Seneca and Shakespeare being the most popular) as an aid in the teaching of management.

The above is because one has to recognize that the science and the art of management are indissolubly tied to the management of the collaboration of many people, to the resolution of situational conflicts and to a style of management based on a solid basis of values. These are conditions that find in culture, in its broader sense, an incredibly rich source of stimuli and suggestions.

USING MOVIES AS A TEACHING AID IN MANAGEMENT EDUCATION

In such a context, teaching in a stimulating manner the logic and the instruments applicable in the running of a company is a necessary requirement. The teaching method must develop the students' ability to deal effectively with the problems which arise from real situations. It would be seriously incoherent to approach the teaching of business-related subjects without the proper and direct involvement of the students themselves, here a more critical factor than in other disciplines.

Agosti (2001) found that among these latter, the use of movies in the teaching of management subjects is one of the newest methods and has particularly good potential for preparing the student. To clear any doubts it must be underlined that the movies in question are the normal circuit ones (i.e. available to the greater public), when they become available on videocassettes, and not short or long films created especially for educational purposes--even if these latter constitute a possible option and are easily found on the market.

This new tool does not constitute, of course, the solution to all the problems related to the teaching of managerial subjects. Just as it obvious that the use of movies during class is not the only way of teaching management, it also presents itself as a useful integrative tool that, thanks to some of its characteristics of content and of method, provides a useful aid in reaching certain educational goals.

Merlino and Parsifal (1998), D'Incerti, Santoro, and Varchetta (2000) found that showing movies can be a useful teaching aid in management courses due to several specific advantages that will be illustrated later. Before describing the advantages, however, it would be helpful to

introduce some considerations that belong to a more general context.

According to Gasparotti (1992) and Simon (1983) learning through movies does not only take place on a rational level, but on a deeper, empathetically level which makes the whole experience more memorable and effective. Today, with attention given to visual culture and all that it implies, "movie language" is particularly well-suited to be understood by all sorts of people, each with her/his own level of capability of interpretation and analysis. The force of the synthesis of the image and the written word and the faculty of "computation" of real situations into short periods of time are characteristics which make the movie an extremely interesting teaching method.

After having formulated these general considerations and having introduced the movie method as part of management education, it is possible to proceed and illustrate what are considered by Baccarani and Brunetti (1999) to be some specific advantages of this kind of teaching.

The Movie as Shared Experience

The plot and the circumstances which unfold during the film become a shared background which can be referred to during "traditional" lessons. The film seen in the setting of the teaching environment becomes information which is shared by the lecturer and the students. It is an experience, albeit vicarious, which is lived by everyone insofar as they have all taken part in the viewing and indirectly participated in the events which have been narrated.

It becomes much easier in lessons and lectures to give suitable examples and find jumping off points for the explanation of concepts when it is possible to refer to situations in a commonly shared film. The impact of the

images themselves make it easier to recall the lecturer's message when it is mentally associated with particular scenes or verbal exchanges in the memory of every student.

The Movie as Mirror of Life

The film is a faithful mirror of the complexity and ambiguity of real situations. Unless the film is pure fantasy or science fiction (in which case its metaphorical content can be drawn upon) it tends to reproduce real or realistic situations, insofar as the director has to create a work which is credible. In this sense the film often offers an opportunity to experience situations in which good and bad, just and unjust, and the useful and useless are not unilateral and constant but depend on the point of view from which they are presented or may vary over time.

The film thus helps to develop a critical sense and analytical skills, as well an awareness of how much more complex reality is than the relatively simple and linear world emerging from text books. Even if the film is naturally unlikely to tell the viewers how to solve specific problems, the acts of watching and studying the film nevertheless constitute a useful form of "training" in facing situations where difficult choices have to be made. It is not in fact a question of learning to solve specific problems, but rather of learning how to confront and how to deal with a whole range of problems which the students will encounter in the real world when they start working.

The Movie as Representing Decision-Making Situations

Films effectively represent decision-making situations. Bearing in mind the previous point, it should be noted that films often show situations in which the spectator has to take sides and assume the burden of choice. In this respect films are often concentrated forms of life

where at any moment the protagonist has to "play for the highest stakes" and every issue may turn out to be decisive. In this way the film is a sublimation of real life, removing all "superfluous" elements such as the waiting times and the preparatory action, and focuses attention on what really counts. War films (such as in recent times "La Vita è Bella", "Saving Private Ryan" and "The Thin Red Line") are excellent examples of this, but they are not the only ones to raise moral dilemmas.

The events which take place in the films help students to appreciate how frequently people are confronted with situations which require taking a clear position, where we are unable to say "it doesn't matter". They also illustrate how the consequences of decisions are different with widely varying outcomes. In these cases, too, the function of the film is to develop competence, to provide a method of reasoning rather than knowledge of facts, and above all, to stimulate a sense of responsibility in people who are still young.

The Movie as Transmitter of Emotions and Values

The film is a good vehicle for the effective transmission of emotions and values. Any film, or at least any successful film, can cause its audience to empathize, to get involved and to participate. More than other forms of artistic expression, movies are capable of sweeping through the spectator's senses. The darkness of the theatre, the size of the screen and the force of the images play their part, as do the peculiarly cinematic techniques of montage, flashback and dissolution of focus. Above all, for a short span of time the audience is drawn into another dimension.

Even though it is difficult for the classroom or lecture theatre to reproduce the environment of a real movie theatre, the film's ability to involve, move and anger remains intact, and in any case it is unlikely that the

response will be one of indifference. To the extent that this is true, the film is an excellent vehicle for the communication of emotions and values and thus favors the personal growth and maturity of the students.

The Movie as Stimulator of Student Expressions of Opinions

The film method is also useful as a means of stimulating those participating in the course to speak in public and to express their own ideas. This goes some way to stop students from becoming passive listeners to the lectures of professors. There is a greater possibility for students to express themselves in relation to a film, with less fear of saying something wrong. It also helps to instill the idea that every opinion has a right to be heard.

THE "MOVIE METHOD": PROCEDURE OPTIONS AND TERMS OF USE

The use of films during class is an operation not as banal as would seem at first glance. One must, of course, take into account that a certain amount of time and energy must be invested in order to consolidate experience and to sharpen skills. The use of movies should not be improvised but should follow a logical, well-defined scheme.

The "movie method" presents several different possibilities and modalities of application. This necessarily involves a series of options, all of which can be legitimately used as long as one takes into account the differences that they imply and the consequences of choosing one option over another.

The options that have been identified are four. The first involves the use of "normal" film industry or "ad hoc" movies. The second is about the use of works with a "business" or a "non-business" content. The third involves

the showing of the movie in its full version or in clips. The last option concerns the operating procedure that is to be followed.

It is naturally desirable that certain basic conditions are satisfied, some apparently simple but not to be underestimated, for this kind of teaching aid to reach its full potential. The first of these basic conditions involves the lecturer/teacher, and the second the kinds of instruments, "hardware" or "software, used. An example of this will be given later.

The Use of "Normal" vs. Ad Hoc Movies

The category of "normal" movies includes national or international films, "author" or "blockbuster" films, recent or older ones. The main point is that these movies are available to the greater public. While the category of "ad hoc" movies refers to those films that are produced by specialized motion-picture industries, and which deal exclusively with various kinds of educational business topics.

Franza and Mottana (1997) found that the products of the "normal" motion-picture industry, first of all, readily attract the interest of the students and challenge the viewer's curiosity as s/he may never have considered the movie to have any connection with the reality of the business world. Secondly, they provide the viewer with a privileged point of view from which to interpret and analyze the contents.

On the other hand, "ad hoc" movies enable a specific argument to be faced, such as creativity, assertiveness or how to deal with an unsatisfied customer. They effectively explain concepts and transmit knowledge in a more direct manner. However, they also furnish situations that are usually more limited and circumscribed offering thus fewer points for analysis and discussion, and

they usually lack the artistic and creative aura that generally characterizes normal movies.

The Use of "Business" vs. "Non-Business" Movies

The second option, "business" or "non-business" comes into play when one decides to use normal movies. "Business" movies include the ones with a business setting such as a factory, or a company, even if this reality is not necessarily what most interests the author. There are several examples of these sort of movies, like "Modern Times", "Gung Ho", and "Other People's Money". "Non-business" movies refer to situations that totally lack any sort of reference to the business world. The examples of this kind are, of course more numerous, such as "Apollo 13" and "October Sky".

The use of both business and non-business movies presents both advantages and disadvantages. When using business movies the advantages are due to the fact that one can work with a known, familiar topic, but at the same time this same fact somehow limits the context, making it seem as the only one possible. The use of non-business films has the advantage of provoking a greater impact on the viewer due to the surprise effect that they create. At the same time, though, the correlation with the business educational aspect can appear to be a bit forced and depressive since the educational cues are disseminated in a more general picture.

Using Full Version vs. Movie Clips

These two alternatives are quite different from each other, mainly because of the consequences that they imply from the educational point of view. Showing the complete movie has the advantage that the integrity of the work is respected and the whole context of the story is presented.

The benefits related to the acquisition of analytical and interpretative skills can thus be pursued to the maximum. The viewing is also undoubtedly a more pleasurable experience.

On the other hand, the length of the whole feature movie may at times come into conflict with the time actually available. It is possible that, during the movie itself, there may be various episodes and sub plots which may have little to do with the subject that was intended to be explored. However, they do force students to separate what is necessary from what is irrelevant to the understanding of particular problems. From this point of view, the movie in its full version has the advantage of introducing the viewer-student to the complexity of reality.

On the basis of the above considerations it is clear that these authors prefer the principle of showing the full version of the movie. However, the use of movie clips does have certain advantages. First of all, the clips technique may at times provide more incisive examples by focusing more directly on target issues. For this reason this technique might be more suitable for base courses where a simple and clear illustration of concepts is appreciated. This technique naturally presupposes some additional selection and research work to be done, and also requires a greater knowledge, on the teacher's part, of movies and also a greater time investment for the preparation of the visual material that is to be used during class.

Instructional Procedures

In the case that the movie shown is "normal" and in its full version (the alternatives recommended by the authors), another option can be applied. This last option is quite significant since it involves the concrete ways in which the method is applied. This means to what extent the theme, and the objects of discussion are to be pre-defined.

The paths which may be followed to this end are basically two.

Path 1. A brief explanation of the method (necessary only the first few times) is presented by the faculty member, followed by an indication of the main themes which should be considered when watching the movie. The film is then shown and an analysis of the content of the movie through group confrontation and discussion follows. Finally, the instructor summarizes the discussion and presents a bibliography for the themes that have been discussed.

Path 2. A brief explanation of the method (necessary only the first few times) is presented by the faculty member, followed by the showing of the film. An identification and selection of managerial themes and an analysis of the content of the film through group confrontation and the discussion follows. Finally, the instructor summarizes the discussion and presents a bibliography for the themes that have been discussed.

The method using the pre-stated theme is undoubtedly the simpler option but it is probably the less "creative" since it limits the individual creativity of each viewer. The option of showing a movie without suggesting lecture keys, on the other hand, works pretty much in the opposite manner leaving greater freedom of interpretation.

Both ways can be legitimately and effectively followed. However, in the initial phase of application of the method, it might be more sensible to proceed with the first method. The second method can be used once it is properly understood since it permits students to freely venture into unexplored territories and to see what seems at first glance invisible.

Necessary Condition for Effective Use of Films

The first condition is that the educator must be personally convinced that the use of movies as a teaching aid is a good idea. S/he must also fully believe in the validity of the method so as to be willingly to run the risk of trying out something new and prepared to overcome the diffidence which may sometimes accompany the novelty of showing movies. Students sometimes see showing movies as a way for the teacher to get out of doing his or her duty, and thus approach the whole matter without the seriousness required. For obvious reasons it is also necessary for the teacher to be a movie fan or at least know which movies are best suited for the intended use.

The second condition is that the classroom where the viewing takes place must be well equipped. It is obviously unnecessary for the classroom to be transformed into a professional studio; however, the importance of this aspect must not be underestimated.

"EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT MOVIES IN MANAGERIAL EDUCATION BUT WERE AFRAID TO ASK"

The movie method was tried and institutionalized during the unfolding of the last five editions of the course Business Management in the Faculty of Economics of the University of Verona. The aim of this section is to illustrate the endeavors conducted up to now so that they can be of some help to those who want to know more about it.

The Course

Business Management is a course that carefully studies the themes of the management of businesses and, differently from the base course, has a less-defined identity.

Since it is an advanced course the program is less rigid and can be altered depending on the inclinations of the professor. In this case, Business Management is a fourth year semester course in the Economics and Commerce degree which is followed by an oral examination. In the first three years the course was made up of 60 hours, while in the last two the hours decreased to 35.

For all years, the emphasis of the course has been on entrepreneurial skills, management skills and leadership. The educators of this course have therefore sought to identify the area of action and the roles of the entrepreneur and the manager by drawing up a picture of the characteristics they must possess in the light of the changes which have been taking place both inside and outside the business world. In a nutshell, the course is directed towards the understanding of what it means to be an entrepreneur or a manager, of what relationships exist between these two, and why and how leadership qualities are required and can be acquired by both.

The course has therefore mainly focused on the personal qualities which future industrial leaders must have to be able to run complex organizations successfully rather than on the traditional managerial methods.

The course consists of a series of academic lectures, albeit conducted with other active teaching methods such as the reading and the discussion of articles, the use of work groups, and the showing of a number of movies related to the themes which have been the object of study. Normally, a two-hour lesson is dedicated to the discussion of the movie.

Use of Movies in the Course

In this phase the various managerial themes that the movies propose are reconstructed in the same manner in which they came from the group discussion. The following

step involves a general classroom discussion in order to list all the possible themes and to decide which themes to search into. In the following lessons these arguments are then developed, supported by articles and documents that allow a deeper theoretical and methodological study of the argument. During the semester course (60 hours) five or six movies are viewed and discussed, and only two or three during the shorter 35-hour course.

Regarding the final exam, the students that attended the course are requested to prepare, either individually or in group, a paper that gives an account and an explanation of a freely chosen movie that particularly struck them and that enables them to reflect on issues from a managerial point of view. Alternatively, they may choose to analyze a specific theme by a comparative study of the different movies viewed in class. A single, specific textbook to be used to prepare the exam is not foreseen since this is substituted with various, suggested readings on the themes that are faced.

The students were not required to have had, nor were they given, specific training in movie viewing. Movies were shown in their full versions. For some movies the discussion took place after an indication of what themes to watch out for, for others it took place freely, meaning first viewing and then deriving the managerial themes. The teacher's role in all this was to coordinate the debate and to stimulate and guide the student comments.

The viewing and the discussion of movies stimulated analytical skills, a critical sense, and the creativity of students. It also accustomed them to the art of speaking in public by defending their opinions. The viewing and the follow-up discussion of the movie made it possible to introduce a wide range of arguments which were strictly concerned with business matters, offering the opportunity to go in detail into applied managerial concepts.

Movie Themes Relevant to Managerial Courses

Taking into account the fact that each movie often offers several possible themes of interest it may be useful to give a schematic picture of the links between the managerial topics and some of the movies shown. The links are as follows:

***For leadership**: Brave heart, The Magnificent Seven, Other People's Money, Twelve Angry Men*

***For entrepreneurial spirit and the breaking of schemes:** Tucker: A Man and His Dream, October Sky*

***For values and creativity**: Dead Poets Society, E.T.*

***For quality and organization**: Modern Times, The Karate Kid III*

***For a positive company–environment relationship:** Gung Ho*

***For the approach to problem-solving:** Apollo 13, La Vita è Bella*

***For group and team work:** Any Given Sunday*

***For lightness and simplicity:** Forrest Gump*

These are the movies that have been used and the links made with managerial topics are fruit of the experience that was developed with time. The criteria being that of the quality of the movie, not so much in an absolute sort of way (admitting that even this can be established) but

rather on how coherent it is to the general picture that is to be followed.

Results of Use of Movies

The results obtained seem positive. Each year students assiduously attended the whole course (for which attendance was not compulsory), and all of them prepared the final paper to present at the exam. The level of enthusiasm shown during the lessons was always consistently high and many students expressly affirmed they had appreciated the method used. Discussion during the lessons has always been lively and full of ideas and stimuli, enabling the teachers as well to discover new points of view and to enrich their own cultural background. Lastly, during the actual exam a greater maturity and mastery in answering the questions could be seen. This is thought to be--at least partly--due to the method herein discussed.

CONCLUSIONS

In conclusion, it is clearly not the authors' duty to evaluate the exits of these operations. The only thing that can be said is that this new role of "apprentice sorcerer" has been and keeps being highly enjoyed by the teachers. The passion for this innovative method has rapidly diffused through the students as well. Some of them actually produced a short movie as the final project on the topic of leadership and on the behavior of youths towards smoking, while others started a self-organized activity of film showing.

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DEBUNKING THE MYTHS

OF ONLINE EDUCATION

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INTRODUCTION

Although online learning has made immense gains in popularity and stature during the past five years, there remains an unrealistic, yet significant, level of doubt as to the credibility of Internet-based education. The sources of this doubt are threefold.

First are traditionalists who believe in the "first-way" technique which holds that teaching in front of the class in a fixed environment is the best method of education. Second, there exists a myriad of research involving classroom-based education while, proportionally and historically speaking, less research is available on Internet-based education. It should be noted that this large gap has closed a bit during the past five years as scholars have hurried to divulge research about online education.

Finally, there are doubters who feel that technology should not be used as a primary method for delivering instruction. These sources, along with others, have acted to cast a doubt on the legitimacy of the online process. At a minimum, doubters conclude that such problems will lead to a prolonged and extensive shakeout in the online market (Carr, 2000). Generally speaking, the legacy of traditional education is not second-guessed. However, the distinction of traditional education shouldn't hinder the ability to utilize alternative (and effective) means of education.

With the development of online methodology comes a credible amount of research, experience, and theory that support this new media for learning. It is obvious that the market for online education is large and momentous.

Interaction Data Corporation notes that by the end of 2002, approximately 85 percent of two- and four-year institutions will offer some form of distance education (Terry, 2000). Monetarily, Interaction Data Corporation expects the online market to reach $6 billion by the end of 2002 (Distance Education Report, 1999).

As a boon to Internet-based education, various innovators, imitators, and converts to the online process are generating research and creating online processes which serve to discredit the myths about Internet-based education. It is this group of individuals, along with others being persuaded to the online forefront, who are creating a new path to online acceptability. Such professionals are vital in leading online education into the mainstream of acceptance as a legitimate form of education.

A central theme to this acceptance is that the quality of online education is not statistically different from its class-based counterpart. Saba (2001) notes that most research suggests there is no statistical difference between online and classroom education. This paper, which serves to demystify some of the misconceptions of online education, is based on the work of such professionals.

DESCRIPTION OF STUDY

Devising a plan for debunking the myths of online education entailed collecting, analyzing, and synthesizing a number of plausible sources of information. The goal was to generate enough information in order to construct a genuine list of the major myths of online education followed by legitimate responses to such myths. These

sources included literature, former and current online students, administrators of online education, a distance education listserv, online professors, and over five years of instructional experience in online education. Such sources allowed for a broad, yet complete, analysis and response to the doubts concerning online education.

The study entailed two major components. First, the collection of information utilizing the sources listed in the previous paragraph (literature, students, administrators, listserv, educators, and self-experience), in order to develop a list of myths concerning online education. Such information resulted in a rather large (and vague) catalog of the major questions pertaining to online education. The list was condensed using a format of the Delphi Group Technique (Griffin, 1999).

After creating a list of myths, additional research (utilizing the same sources as mentioned before) resulted in finding plausible solutions to address them. These solutions are commonplace and were not difficult to find. Those individuals and entities with a vested interest in online education provided the vast major of solutions. For example, marketers (i.e. admissions representatives) who must generate legitimate responses to such questions in order to capitalize on the emerging online market, were effective sources of information. Additionally, educators who have experience and success in both modes of education were quite capable of providing answers to such myths.

In a similar fashion, students of both techniques were quick to point out the various differences and similarities. Also, administrators of online education were quite frank in their ability to elaborate on the pros and cons of both methodologies. The listserv was relevant in that it provided a continuous, updated discussion of the myths about online education. Finally, self-experience served as a

major catalyst in synthesizing the raw research into usable data.

Unfortunately, it is imperative to promote such solutions in order to validate the use of online education as a method of delivery in higher education. Debunking such myths is necessary in order to allow online education to take its place as one of a number of acceptable methodologies within the field of education

RESULTS AND DISCUSSION

Myths Of Online Education

Based on an analysis of the sources of information, the major myths of online education appear below.

1. The credibility of online education is less than that of traditional education.

2. Online-based student learning is inferior to that which takes place in the classroom.

3. Online coursework cannot be evaluated like that in the traditional class.

4. Online communication is less effective than that which occurs in a classroom.

5. Breakdowns in technology hinder the effectiveness of online education.

6. Connectivity and bandwidth hinder the online process.

This list contains the most common challenges to the online process. With a variation of the Delphi Group

Technique, the goal was to include concerns that appeared in the largest number of sources. The list could be expanded to include many concerns but is limited to the major reoccurring doubts mentioned in the research. Also, this list will likely change as questions are answered and more doubts discovered during the implementation of online education into conventional education.

There are explanations that go far in disengaging such myths in order to laud the effectiveness of online education. These explanations, as identified through the various sources of research, are listed in the following sections.

Myth #1: The Credibility Of Online Education Is Less Than That Of Traditional Education.

Various institutions, associations, and accrediting groups are stepping forward to show that online education is comparable to class-based education. At the federal government level, the U.S. House of Representatives passed a bill changing rules for Internet-based college courses in order to relax the requirements for financial aid (Hoyt, 2001). Part of this change was derived from the demand for the extensive amount of online courses offered in higher education. This bill allows for more online courses to be offered while being funded, in part, by government-based financial aid. As another mark of credibility, top-tier postsecondary institutions such as Columbia, Stanford, and Duke University are offering such courses.

However, the benchmark for such approval occurred in 1999 when the North Central Association of Colleges and Schools granted accreditation to Jones International University, an online-based institution (Perley & Tanguay, 1999). This was the first case of regional accreditation for an online institution. It should be noted

that the various regional accrediting agencies, along with many professional granting bodies, have joined in offering review and approval for online education. This seems to be in response to the market and the desire for online learning. These bodies apparently realize that with appropriate acceptance by reputable national groups, the online market will grow and prosper due to student demand.

Wall Street has taken notice in that for-profit Internet-based institutions have averaged higher returns than the general market average during the 1999 to 2001 period (CNNfn.com, 2001). This may be a sign that investors have noticed a gain in the trend to online acceptability. Finally, more book publishers are accepting the trend and are willing to offer a multitude of options for distance educators. Whether in the form of software, online books, technical support, or dedicated server space, such publishers are making it clear that the online market is legitimate and should be accepted as part of the business model of education.

Myth #2: Online-Based Student Learning Is Inferior To That Which Takes Place In The Classroom

As mentioned earlier, a large and legitimate number of recent studies indicate that there are no significant differences between online and classroom-based education. This is true regardless of the variables being analyzed (knowledge obtained, scores generated, etc). Pure numbers tend to defend such a notion as, according to InterEd, approximately 50,000 adults are seeking accredited online degrees, (Terry, 2000). It is also important to point out that the National Education Association has concluded that distance education can result in quality learning (Carnevale, 2000).

The studies provide strong support for online education's effectiveness as a medium for learning.

Although learning is a combination of many things, especially prominent roles are played by students, instructors, and the mode of delivery. In terms of the mode of delivery, the Internet can be on par with the lecture, and. in some instances, may exceed it. And, of course, the Internet provides learning opportunities for many individuals who otherwise would not be able to attend college classes.

When looking at the quality of the two processes, it is fair to state that the quality of both appears relatively equal. Ehlers (2001) noted that quality can be seen from four viewpoints: learner/client, teacher/professional, institution, and political policy. In all four scenarios, the notion of differences in quality is almost impossible to prove, which leads stakeholders to accept that quality is similar throughout both mechanisms. There are pros and cons of each system but, when played to fruition, each has many quality features.

Myth #3: Online Course Work Cannot Be Evaluated Like That In The Traditional Class.

The central issue involves the ethical behavior that is expected of students in education. One must understand that in most, if not all, forms of education, it is possible to cheat or plagiarize! As with traditional education, the online methodology provides a number of acceptable methods for grading which can be based on tools such as remote or on-site proctoring, video imaging, software and voice or eye recognition, among other items. An emerging option is to avoid testing altogether in favor of research, communication, problem solving, case studies and other forms of assignments that can be handled individually or in collaboration with other students.

Reality suggests that the educator is not always sure, whether in a classroom or online, if a student is the

individual completing the work. This is true for many grading areas such as papers and exams. In the case of research papers, such work can be purchased online, plagiarized, or written by another individual. There is a growing industry for the buying and selling of research papers of all topics and sizes. Unfortunately, the student can receive credit without writing a single word. This holds true for all methodologies of education that require research papers as a component of grading.

As for exams, proof of work creates other dilemmas. For example, a student could ask another individual to serve as his/her replacement in order to take an exam. Unless the instructor asks for identification (how many ask for ID during the first day of class?) there will continue to be a high level of uncertainty. Additionally, there is an increasing number of take-home exams permitted in higher education. This format of testing provides the laxest form of structure and could be construed as an environment which encourages cheating. Regardless of the grading tool there are ways to cheat the system, be it in the traditional or online class. Both methods of education allow for such opportunity to exist.

As indicated above, online education, as with traditional formats, offers a number of evaluation criteria that can be utilized by educators (Buber, 1998). As experience suggests, it is a matter of evaluating such tools in order to find a proper fit so that the correct tools are used in the appropriate situation. The learning that takes place in both methodologies can be evaluated in an effective and efficient manner.

Ultimately, all forms of education rely on honesty and appropriate ethical behavior. Some institutions, like Gettysburg College, have implemented an "honor code" that students must pledge in writing before completing graded assignments. Part of this measure allows students to take exams in an unmonitored environment.

Myth #4: Online Communication Is Less Effective Than That Which Occurs In A Classroom.

This myth has been deemed inappropriate since the advent of online courses. Barnes and Lowery (1998) found that communication in online courses can be at least as effective as that which occurs in class. Moreover, many of the students and professors of online education report that communication is enhanced because speech anxiety is virtually eliminated when using email and other forms of Internet-based communication. In fact, a study conducted by Kubala (1998) found that 94 percent of online students felt similarly or more connected to their instructors as compared with traditional classes. This reinforces the idea that online education may be a better forum for allowing effective communication. Such on-demand communication can be touted as anywhere, anytime and is extremely effective in promoting communication among class members. This is a clear-cut case where the online technology provides efficiencies over the traditional class.

Email, chat rooms, listservs, bulletin boards, and other forms of Internet-based communication are fast becoming commonly held computer skills and thus are not a hindrance to effective online education. Brown (2001) notes that email is simple to learn, easy to use, allows for immediate student attention, and provides a short feedback loop. With these advantages it is easy to ascertain how many experts see online education as offering more efficient ways to communication than that of the traditional classroom. Even Peter Drucker, the guru of management, notes that there are great efficiencies in building feedback and direct contact into Internet-based education (Chapman, 2001).

Another advantage to online education is that the use of email, listservs, chat rooms, bulletin boards, and

other electronic communication devices permits faculty to grade class participation in a manner that offers greater efficiency than most traditional class formats. In many cases, traditional educators offer participation grades at random with little evidence of actual contribution to the class. As for online participation, one can use the various communication tools in order to generate specific dates and quantities in order to create a grade that reflects each individual's contribution to the class.

Myth #5: Breakdowns In Technology Hinder The Effectiveness Of Online Education.

As more institutions ramp up to the online market by funding training, technical support, infrastructure, software, servers and other items that are now combined into what is referred to as a digital plant (Boettcher and Kumar, 2000), this criticism becomes of less concern. As the online market develops, new technologies and software have been created and updated in order to facilitate effective education without the fear of complete breakdowns.

Although breakdowns occur, it is no different than a breakdown related to attendance in a traditional class-based course (such as a professor or student not attending a traditional class because of a failure in transportation). The point to make is that there is reliance on technology, regardless of the mode of education. The reliability of technology improves as such methodologies are revamped with time and experience.

There are several emerging trends in order to alleviate problems in computer technology. One is the use of backup systems in order to create a secondary system for online education. Such backup can be in the form of software, hardware, or printed literature. Regardless of the

situation, backup technology alleviates many of the earlier problems generated from failures in technology.

The second item is the emergence of dedicated servers that are separate from other campus servers and support nothing except online education. By providing such servers, colleges and universities are finding that technological problems are becoming less frequent than in the past.

The third trend is to use technical support or an 800 number in order to provide "live support" in the cases of extreme problems with the online process. This allows for live interaction in order to solve problems.

Finally, some institutions and/or instructors are opting to allow students to "drop-in" to a traditional class if there is a problem with the technology. The parallel course allows for a mind-easing safety net where students have the luxury to access a traditional class should a problem develop with technology. Of course, this assumes that the parallel course utilizes a similar schedule. Regardless, this is another step in the direction of cross-configuring both methodologies into analogous patterns of class utilization.

Overall, as with other forms of instruction, teaching online requires a contingency plan in case of the "what if" scenarios that play out during the time period utilized for class. As with snow days or illnesses that interrupt traditional education, the online educator must be prepared for the plethora of interruptions that can act to hinder the online process. In other words, all educators must create contingency plans for effective education!

Myth #6. Connectivity And Bandwidth Hinder The Online Process.

Although bandwidth and connectivity vary from campus to campus and individual to individual, colleges have invested heavily into the pipeline in order to generate

adequate access to, among other things, online education (Olsen, 2001).

Also, access to connectivity is moving rapidly across all demographics (something that was slow to happen with many of the former technologies). Recent efforts by various levels of government along with corporations such as AT&T, Cisco, Hewlett-Packard and Microsoft, have made it possible for the country to be connected. There are pockets of inaccessibility but such problems areas are the exception.

To some, the "digital divide" is difficult to justify. The digital divide could exist in some format or another but should not hinder the effectiveness and accessibility of online education. Young (2001) notes that talk of such a divide may be creating a self-induced problem and that the divide should not hinder online education. Also, worse case scenario is that an individual could use public access (i.e. libraries) in order to attend class. However, with the increased information technology budgets being sought by various institutions, the reality is that connectivity and accessibility are increasing rapidly across the board of demographics.

CONCLUSIONS

Overall, there is room in the market of higher education for both online and traditional classes. This coexistence requires both parties to understand the strengths and weaknesses of their counterpart's methodology. In fact, cooperation could result in improvements for both systems while providing for a more efficient technique for education. Such cooperation would result in new possibilities both in the classroom and online (Grush, 2001).

The alternative is to maintain the current status where boundaries are drawn and battles declared in

contrasting similar, yet different, styles of education. In this case, the losers are the students and educators of both methodologies.

Although there isn't a map that clearly shows the way from the chalkboard to cyberspace, that should not hinder the ability to convert some courses to an online format while leaving room for both traditional and online courses within the framework of the broad market for education (Bisoux, 2001). In the battle of tradition versus technology, there is a legitimate place for both to function peacefully and efficiently. A peaceful coexistence would benefit all stakeholders of education.

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ACTIVE LEARNING

WITH ONLINE CONTEXT-BASED MODULES

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INTRODUCTION

Active learning is defined as students engaged in higher order thinking assignments (Bonwell & Eison 1991). The higher the level of questioning, the more thinking that is needed and the greater facilitation of learning. The highest-level questions are those in which students need to make comparisons, inferences, and evaluate and judge. A goal of active learning is to teach students how to pose their own questions.

One of the many challenges of teaching is to nurture an intrinsic motivation to learn over the life-course. To nurture intrinsic motivation is in itself challenging as documented in the literature. The results of motivational research indicate that students learn more when they can exercise choice, have a sense of control, are challenged to think critically and can collaborate in the learning process.

Students are also more motivated when they are asked to learn course content in context, understand the relevance of the subject matter in a timely fashion, and can periodically assess what they have learned. While attempting to motivate students is an onerous task in the classroom where the instructor is present, the task is even more challenging when learning occurs online in the absence of an instructor. Last, students do best when they can easily navigate among Web pages.

What follows is a description of an online Web-based module that is context-based and in which learning is non-sequential. The module is one of four that were designed to stimulate student learning using the results of the research discussed above.

OVERVIEW OF MODULES

These modules were developed as a supplement for a new Biology textbook, "BioInquiry" (Pruitt, Underwood & Surver, 2001). The four modules deal with species preservation, biotechnology and water.

The first module is based on this question: *Cheetahs --an endangered species: can and should they be saved?* The cheetah module covers issues such as speciation, reasons for why the cheetah is facing extinction, cheetah ecology, cheetah taxonomy and the classification of rare, threatened and endangered species. The next two modules deal with biotechnology.

The first biotechnology module covers genes through tissues. Specifically, the material explores gene therapy, tissue therapy, the human genome project and transgenic research. The topics covered in the second biotechnology module range from organs to ecosystems. The specific material covers organ transplants, growing new organs, transplanting organs from other animals, birth control, human infertility solutions, artificial breeding programs and pollution remediation.

The fourth module is on water and why we should care about it. Some of the topics included in this module include chemistry and physics of water, reproduction and excretion patterns, hydroskeletons, the water cycle and its impact on ecosystems and water pollution.

These modules are interlinked at crucial nodes. For example, a student learning about artificial breeding programs in a biotechnology module will be able to link to

the cheetah module and learn about breeding efforts to increase the genetic diversity of cheetahs. When the cheetah module discusses reproduction problems with these large cats, a student will be able to link to a biotechnology module to learn about useful techniques to increase fertility. Each module is interlinked to the other modules at least five times.

This paper will emphasize the Cheetah module, which has been tested by students at two Virginia magnet high schools for the gifted, in the author's college introductory Honors Biology class and by students in several sections of General Biology laboratory when they were conducting fetal pig dissections and learning about ecology. The following discussion of the cheetah module will illustrate how the online modules attempt to motivate students to learn beyond the material presented in the textbook by focusing on the findings of motivational research.

THE CHEETAH MODULE: AN EXAMPLE

Creating Curiosity

In his studies of human curiosity, Berlyne (1954a, 1954b) found that students learned more when they were asked questions, and learned less when they were taught facts. Further, the more familiar a student was with a subject, the more effective the questions were in arousing curiosity to learn more.

Cheetahs are not only large, beautiful cats, but many people are aware of the blight of the cheetah whose numbers are decreasing rapidly. Most, but not all, students are drawn to these big cats and easily become involved in the questions, which are presented in the module.

Use of Questions

The purpose of asking questions is to direct attention to specific details, encourage thinking and relate to prior knowledge. These modules contain different levels of questions with most focusing on higher order learning and critical thinking. The majority are open-ended questions.

For example, there are convergent questions asking students to find a specific answer, and divergent questions where a student is asked to propose multiple solutions. There are also interpretive questions where students are asked to make comparisons and judgment questions that require them to evaluate and choose. Last, there are memory questions to help students focus on specific content.

Socratic Discussion

Socratic discussion involves asking questions embedded within each other. The answers to the major questions (module titles) discussed above create other questions, the answers of which are necessary to understand the material being presented. In turn, the answers to these questions are the basis for even more questions. The cheetah module contains over 190 pages of text and most of these pages contain multiple questions for the student to answer.

How would you expect students to answer the question, *Cheetahs--an endangered species: can and should they be saved?* To put this question in perspective, students are immediately introduced to a brief history of human-cheetah interactions for the last 5,000 years. Then students are challenged with five major questions:

What is a species?

What is an endangered species?

Why are taxonomists interested in cheetahs?

Why are ecologists interested in cheetahs?

Why are cheetahs becoming extinct?

To answer these questions, other questions must be asked, and so forth. The cheetah module begins with broad questions and ends with specific and diverse questions, such as how many genes does it take to create a new species?

Socratic discussion also involves formulating general principles from specific examples and applying those principles to other cases (Collins 1977). As students work through the module and think about cheetahs, they are ultimately challenged with questions about the plants and animals that are found near their own home.

Students are asked to consider the species of plants and animals that may not be on the federal list of endangered species but are species their state wants to protect. In dealing with these questions, students are asked to consider the role of these organisms in their local environs. The take-home message is that it is easy to think about cheetahs, which are endangered, but it is equally important to deal with the species in one's local environment as well.

Context-based Teaching

These modules are focused on context-based teaching. Context-based teaching is known by several names such as situation-based learning, thematic-based

learning and learning through case studies (McKeachie 1999). Context-based learning is most often presented in textbooks as the critical thinking or applied questions presented at the end of the chapter. It is a shame that the most interesting questions are left to the end of the class where they are rarely discussed, when they can be used to start a class on a journey of learning and application. Context-based learning can be used in a larger framework in that a few properly selected questions can be used to teach virtually all the material typically found in a traditional course.

In the learning process, the textbook becomes an important instrument in the creation of answers. What is most important about context-based teaching is that students learn material as needed to answer the questions that are posited.

Non-Linear Learning

Learning material as needed is a deviation from the traditional course in that the material is not presented in a linear or sequential mode. This model of instruction has been with us for decades and scientists are comfortable teaching in this manner. Suffice it to say that most texts are also written in this manner. As students learn sequentially, they tend not to understand the relevance and application of facts until much later in the semester.

Students are currently spending much time on computers studying a wide diversity of subject matter. A considerable amount of this computer-based instruction is linear, sequential based approach similar to a traditional classroom lecture or textbook. The material is presented as "you-need-to-know-this" material because it will be important later. There is little, if any connection, to the future material found in the book and I dare say, that later chapters of a text rarely refer to the concepts found in the

earlier chapters. These modules allow a student to integrate information when it is needed.

Having Choices

Students who have choices are apt to be more motivated to learn and understand new material in the context of self-regulated learning (Hagen & Weinstein 1995) and Zimmerman (1994). The cheetah module is filled with choices. Upon entering the module, students are invited to begin with any one of the five major questions. And as they continue through the module, they can continue to select from a variety of other questions. As students begin to work through a particular question set, they will invariably find themselves going to another part of the module to find potential answers to their questions.

In addition, the sections of the module, in this instance the five major questions, are color-coded. At the bottom of each page students can elect to move at any time to another section of the module.

At critical points within each module, students are invited to visit one of the other modules to either find possible answers to a question or to learn how the information they have just learned can be applied to other problems and issues facing society. When students link to another module, they maintain connection to the original module they were in so they can quickly return when they want to.

Further, each module has a side bar that allows the student to go immediately to a specific page within a module. In so doing, the student has complete freedom to choose a preferred learning path through the material.

Last, context-based learning modules offer students multiple routes of entry. The five major questions noted above offer students a choice of where to begin to answer a major primary question. And to gather the correct

information to answer the primary question, a conscientious student will answer all the questions posited. Students will also be able to enter the exercise by asking more specific questions. For example, if a student is interested in viruses, s/he could enter the module by asking about the effect of viruses on cheetah population dynamics.

Critical Thinking

Much has been written about teaching critical thinking in the sciences. Critical thinking describes "both a set of activities and a particular frame of mind or set of attitudes" (Rehner, 1994, p. 1). Critical thinkers ask strategic questions and weigh evidence as they ponder innovative solutions to problems. Critical thinkers are curious and go beyond the question being addressed. Critical thinkers learn from others while remaining independent in making decisions.

In another study, Svensson (1976) noted that learning increased as the complexity of the assignment increased. Questions requiring critical thinking produced the most learning because the questions required "deep processing" of reading material.

Critical thinking is inherent in the cheetah module. For example, the cheetah module asks the students to compare hunt data of cheetahs living on the Serengeti with statistics about Thomson's gazelle annual recruitment of offspring. Students are asked to devise an experiment to accurately estimate the size of the remaining cheetah population. Or they could be asked to suggest several means by which this cat can be saved from extinction.

Collaborative Learning

Students learn more material when they are teaching each other (McKeachie, 1999). While students can

independently work through this module, it was primarily designed for students to work together in groups. The cheetah module also contains 66 worksheets that help students organize their thoughts.

Relevance

This teaching strategy has other advantages. It not only models the scientific process by integrating diverse information, but it allows us to go beyond biology and bring in societal, cultural and ethical issues that are not only influenced by the results of scientific studies, but influence what we study and how we study it.

When students have gathered the information necessary to answer the question of whether we should save cheetahs, they will need to pass an open-book quiz before they can finish the cheetah module. The quiz contains approximately 35 questions about concepts and each student must pass the quiz with a score of 90% or greater.

When the student passes the quiz, s/he is immediately asked the original question, should the cheetah be saved or not. If the student says no, s/he is invited to re-explore the issues of biodiversity and conservation. If the student says yes, s/he must address the issue of cost.

Is the student willing to save the cheetah if the projected cost is in the tens of millions of dollars per year? If s/he says no, s/he is again directed to re-explore issues of biodiversity and conservation. If the student says yes, s/he needs to explore how this effort will be paid for. Specifically, what social programs will need to be dropped to raise the funds to pay for this effort, or will the student, as citizen, be willing to pay more in taxes? If s/he still feels strongly about saving the cheetah, then the question is how will this be done?

In part, this last question leads back into the module because possible answers may include increasing reserve size and controlling predators. Or the student may consider increasing genetic diversity which will lead to the other modules. Will genetic diversity be increased through selective breeding programs, or should gene therapy be used? If the student elects to use gene therapy, then s/he needs to consider where the DNA material will come from. Do you transfer genes from other fields, or from dead and fossilized cheetahs? Or from other mammals? Or do you consider using hormone therapy to help the cheetahs to adjust to cramped breeding quarters or becoming better mothers?

Dealing with Student Frustration

Students who cannot navigate easily throughout a Web site are easily frustrated and will lose their motivation to learn. As described above under the section on choices, students have complete freedom to move among the Web pages and between the modules. While freedom of choice and mobility is an asset, this can also be a liability. If a student is not careful, s/he can get lost. At the bottom of each page, a student can access a map to show where s/he is in the matrix of Web pages.

Students can also be easily frustrated if they cannot find answers to their questions. Each page that has a pertinent question, also has a link to a help page that gives students key words to look up in their text, or to use as they search for answers on the Internet.

Assessment

Students need some form of assessment as to how they are doing. The cheetah module addresses self-assessment in two ways. First, the student can down-load

work sheets that contain the same questions found on specific Web pages. These worksheets can be down-loaded as needed by connecting to a link on the bottom of each Web page, or from an index of work sheets that also serve as an informal outline of the material covered in the module. Second, the quiz noted earlier with its attendant questions is another way to assess if the student has sufficient knowledge to address the ultimate, or original, question about whether cheetahs can or should be saved.

SUMMARY AND CONCLUSIONS

Context-based teaching can be used to motivate students to learn. Not only is the course material presented in a non-linear manner, but also students can navigate through the material at their own rate, exercise choice in how they move through the material, have a sense of control and are challenged to think critically in a collaborative environment. The material is relevant. Students have a means to periodically assess what they have learned and they can easily navigate among Web pages.

It has been the author's experience that not only did students have more fun, but they also learned more than they would have in a traditional lecture course. The students' response to this mode of teaching has been favorable once they understood the learning objectives of the author and why there were so many questions in the module.

Several students, who were reporting to their school administrators, said it best. One told them:

> *At first, I did not like staying on the computer so much, but when I worked on this at home at night, my other work suffered. I could not stop looking.*

A second student noted that he:

> *Started reading way past what [he] was supposed to...I just kept going. Nothing ever made me do that before.*

In conclusion, one student commented that the work on this module:

> *Taught us to use our own abilities*

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MOONSNAIL PROJECT: ROLES OF TECHNOLOGY AND RESEARCH IN LEARNING SCIENCE

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INTRODUCTION

The National Science Standards set a high bar for K-12 student learning outcomes in science. The standards for grades five to eight call for students to have the "abilities necessary to do scientific inquiry" including the "ability to design and conduct a scientific investigation" (National Research Council, 1996, pp. 145).

Students learn science best when they are engaged in science (Donovan, Bransford, & Pellegrino, 1999). The Moonsnail Project (2001) seeks to get students excited about discovery and engage them in the process of science by making them collaborators with scientists in the investigation of a genuine scientific hypothesis (Hansen, Kelley, & Hall, 2001).

Teachers and students become part of a nationwide research team that gathers and analyzes evidence to test this hypothesis. After three to five years of data accumulation, the question is answered in that the hypothesis is accepted or rejected and the results published. Having students address genuine scientific hypotheses makes sense if we want them to learn how to do science. First of all it makes the scientific activity authentic. The data they are collecting

will be used to expand human knowledge, not rediscover something we already know. Secondly it makes their scientific activity authentic in practice. They need to collect and analyze their data in a manner sufficiently rigorous that it withstands the scrutiny of peer review (from the students in other schools and the scientists).

DESCRIPTION OF PROJECT

For over a decade, the authors have been working on the evolution and fossil record of predation by moon snails. Moon snails are carnivorous marine animals (Mollusca: Gastropoda) that drill a distinctive round hole in the shells of their prey (usually clams). Although a great deal is now known about fossil moon snails, there is relatively little information about geographic patterns of drilling behavior in living moon snails.

For instance--*are temperate moon snails more destructive than tropical ones? Does the predatory efficiency of moon snails vary in different oceans?* The answers to these questions are important in interpreting our growing knowledge of the fossil record of moon snails. In the Moonsnail Project, middle school teachers and their students from around the country collaborate with scientists and function as a national research team, collecting data from widely different geographic areas in order to critically test these hypotheses.

Moon snails and their prey are ideal subjects for collaborative research with school-age children. Shells are easy to collect and beaches are fun places to visit. Drillholes are readily apparent and simple to count so that student-collected data have high reliability. In addition, visits to beaches afford the opportunity to discuss many other science topics including tides, beach processes, and intertidal animals.

Grades five to eight were targeted because studies have shown that these grades are a crossroads for students in regard to science. At this stage many children make a decision as to whether or not they like science based on school science activities--and unfortunately, most decide in the negative.

For example, the Third International Mathematics and Science Study (1999) shows that while only one country outperforms U.S. students in math and science at fourth grade, nine countries outperform the U.S. by eighth grade. In addition, girls' interest in math and science declines significantly during these years compared to boys (AAUW, 1992).

The Moonsnail Project curriculum was designed to be inquiry-based and engaging by using hands-on activities. Students learn about changes in fossil marine communities by comparing and contrasting real fossils from 500 million-year-old rocks in Utah with those from 1 million-year-old rocks in North Carolina.

The curriculum begins with the fundamentals of marine ecology and paleontology and ends with the scientific context for the moon snail research. The curriculum directly addresses 14 out of the 28 National Science Content Standards for grades 5 to 8 (National Research Council, 1996). It also includes lessons in the use of communication technologies such as Website construction and videoconferencing software.

FINDINGS

The first 12-day teacher workshop was held in Wilmington, North Carolina in July 2001. Fourteen teachers were chosen to attend from seven states (Alaska, Washington, Oregon, New Jersey, North Carolina, Georgia, and Florida) based on their level of interest in the project and their geographic location. The authors also sought

classes with strong minority enrollment because most non-white ethnic groups are poorly represented in the sciences (National Science Foundation, 2000). The students involved are 62% Caucasian, 15% African-American, 12% American-Indian, 7% Asian and 4% Hispanic. With further funding, 14 teachers will be trained each year for three to five years.

Results from the workshop were very positive. On pre- and post-workshop surveys for content and skills, teachers rated themselves as having improved by an average of 69%. Most were relatively experienced teachers who had attended numerous educational workshops and had participated in national educational initiatives. All of them said that this project was exciting and special because they were working with real scientists, doing real science.

A teacher from Moncure Elementary School in North Carolina (L. McCombs-Porter, personal communication, August 15, 2001) commented: "The most important difference for me was the whole idea that students and teachers could be involved in meaningful, authentic science." A faculty member from Oxford Central School in New Jersey, said, "I know of no other workshop where children are involved in actual scientific research" (D. Glenn, personal communication, August 5, 2001). Also, a teacher from Clarke Middle School in Georgia stated: "The moonsnail workshop actually involved us in your research. It is real science. You folks allowed us in. Into your part of the game. You trusted us with something valuable to you. You allowed us to invest in the task. We bought in so we really want our part to be done well." (M. Burns, personal communication, August 29, 2001).

The teachers' enthusiasm did not wane once school started. Thirteen of the 14 teachers (93%) have incorporated the Moonsnail Project into their curriculum and are actively pursuing the investigation. The national

nature of the project is a powerful asset because the students and teachers feel they are part of something big and important. This also excites parents and gets the attention of local newspapers, which in turn encourages the students and teachers. As of November 2001, local newspapers have carried stories about two of the participating schools for involvement in the Moonsnail Project (Carter, 2001).

Technology is absolutely critical to the success of this project because of the geographic separation of the participating schools and scientists. While doing real research is the hook for many students and teachers, communication technology is the glue that makes it work.

Two basic types of technology have been employed: videoconferencing and Web communication, including the Moonsnail Project Website (2001) and the individual class Websites. The project Website contains resource materials, online data entry forms and a discussion board. It serves as a central site where lesson materials can be reviewed and scientific data can be pooled and accessed, and as a valuable advertisement for the project.

Parallel and complementary to the project Website, each class is creating its own Website, which will in turn be linked to the project Website. An example created entirely by two students is the Summerour Moonsnail Project (2001). These class Websites serve as showcases for the work of the students, provide publicity for the schools, and encourage parent and civic participation in the project (D. Shook, personal communication, November 11, 2001).

Videoconferencing (using Webcams and NetMeeting software provided by the Moonsnail Project) allow classes to speak directly to scientists as well as to each other. Being able to speak directly to a scientist is extraordinarily motivating for the students, as made evident in this quotation from an online news article about Clarke Middle School in Georgia:

The universities are paying for Web cameras to be set up in participating schools so that the students can video-conference with other schools around the country, as well as the professors. This excites [a] Clarke Middle School student. "In the teleconference over the Web, I'm thinking I'm going to be talking to scientists all around the world. They'll say, 'So. Tell me what you know about moonsnails.'" (Carter, 2001).

Interacting with a scientist personalizes the experience and confirms for students that they are doing real science, not just being spectators. A teacher from Oxford Central School in New Jersey said:

> ...most importantly you and Tricia will con unicate with the kids. You are making it real, not over nflated. You are working with them and talking to them, NOT AT THEM. That is what makes the difference, keeping it real. For my kids having access to you and Tricia will make all the difference in the world (D. Glenn, personal communication, August 5, 2001).

Communication between classes is motivating and valuable on many levels. Developing social links with students in other classes (i.e., science pen pals) is a powerful incentive for student participation.

Communication also allows students to build on each other's knowledge, which supports a constructivist teaching approach. "Constructivist teaching requires that instructors be partners with students in their learning, that they actively solicit students' points of view, as well as provide for them learning experiences that are relevant to the world outside the classroom" (Carlson, 2001).

For example, NetMeeting software permits students in different states to view spreadsheets and compare

graphs, making it possible for research teams composed of students from different schools to share information. A teacher from Moncure Elementary School in North Carolina commented, "I think that the continued communications and links between all of us are another unique aspect of this workshop which will benefit us and our students" (L. McCombs-Porter, personal communication, August 15, 2001).

SUMMARY AND CONCLUSIONS

In its first year, the Moonsnail Project successfully combined an authentic research question with communication technology to engage middle school teachers and their students in scientific inquiry. Being part of a real research project with real scientists was extremely motivating for students.

Web and videoconferencing communication technologies provide the vehicle that makes a nationwide network of scientists and student researchers possible. As the Moonsnail Project flourishes, a growing Web of students and scientists will collaborate electronically to participate in the authentic practice of science.

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LINKING UNIVERSITIES AND K-12

THROUGH DESIGN

OF OUTDOOR LEARNING ENVIRONMENTS

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INTRODUCTION

Thinking outside the box is sometimes difficult when students and teachers are working within the constraints of a traditional classroom. Students especially have their outlooks limited by classroom walls because they often do not yet have a wide perspective on the potential for their actions to have civic consequences. To promote thinking outside the box, an interdisciplinary group of students and faculty from several institutions and members of community groups have undertaken an ongoing multi-grade collaboration to design and install sustainable outdoor learning environments using a service learning model.

John Dewey (1939), early articulated the importance of involving students with their subject in an

interactive and meaningful way through experiential education. Community Service Learning is a pedagogy of reflective inquiry linking students' involvement in community service with their intellectual and moral development (Saltmarsh, 1996). According to Kupiec (1993), integrating service and academic study provides educational benefits including more effective teaching and learning, more effective serving and more effective collaboration between campus and community. Research shows that when compared to traditionally transmitted courses, students in service learning courses have higher academic achievements when measured by mid-term and final examinations or pre- and post-tests, (Bringle & Hatcher, 1996; Madden, 2000).

Duckenfield and Wright (1995) observed that service learning today is characterized by a framework including four components: *Preparation, Action, Reflection* and *Celebration*. Steven Madden (2000) illustrated the effectiveness of this approach by documenting a wide range of case applications in higher education in his book, "Service Learning Across the Curriculum". Research shows that service learning can help individuals not only develop knowledge and practical skills, but also "life-long social responsibility and civic values" (Checkoway, 1996, p. 600; see also Bringle & Hatcher, 1996).

Combining community service with academic research, reading, writing and reflection can ensure that service enhances, and is enhanced by, the learning process (Miller, Steele, & Smith, 1995). This connection between community participation and classroom learning can help students meet course objectives while also developing a sense of civic responsibility.

Many theorists and reformers identify a need for higher education to become more relevant, more integrated, and more connected to the community (Bringle & Hatcher, 1996; Nyden et al., 1997). Business leaders are asking

educators to produce more well rounded individuals with relevant experience and good social and creative thinking skills. Service learning meets these needs. Also, McAleavey (1995) found that students frequently develop a sense of connectedness to their community through bonds forged with the client groups and colleagues at their service site—another plus for this type of learning.

Educational reform that fosters environmental stewardship and the development of environmental stewards is also needed (Orr, 1995; Corson, 1995). Service learning can provide an avenue for such changes to happen (McAleavey, 1995; Madden, 2000).

SUSTAINABLE SCHOOLS CASE STUDY

A case study involving the formation of learning communities to design outdoor learning environments for eight K-12 schools in South Carolina well illustrates the methodology of service learning. An interdisciplinary group of students and faculty from several institutions have worked since 1999 on this ongoing multi-grade collaboration to design and install sustainable schoolyard habitats throughout South Carolina. The group is now expanding to form partnerships in Minnesota as well.

Project Goals

The collaboration has a number of goals:

To research, design, install and reflect on sustainable and efficient landscapes for schools, many of whose schoolyards are currently desert-like

To brainstorm and take action on issues that can make the schools and other public spaces more sustainable

To provide an opportunity for students to learn and develop communication skills through participation in a project that has a community impact

To reach out to and learn about diverse populations and disciplines by sharing information about sustainable community environments

Building on the schoolyard habitat program and Campus Ecology established by the National Wildlife Federation and the South Carolina Wildlife Federation, this ongoing project involves both university and K-12 school students in identifying environmental problems, using critical thinking skills to propose solutions and taking action to effect change. Environmental issues including design, wildlife habitat, transportation efficiency, energy use, recycling, water use, landscape maintenance, and biodiversity are addressed. In addition, teaching and learning issues such as curriculum development, critical thinking, analysis and development of communication skills are also addressed.

Many of the project's goals were developed and discussed in a colloquium hosted at Clemson University in September of 2000. Invited speakers from the Sustainable Universities Initiative, the South Carolina Wildlife Federation, Duke Power, and the South Carolina Native Plant Society were invited to lecture and brainstorm with students and faculty participating in the project.

Students presenting the results of the brainstorming sessions indicated their interest in working towards advancing their knowledge and commitment to environmental stewardship and enhancing others' education through this partnership. Non-profit organizations like the South Carolina Wildlife Federation

have provided valuable information and contacts through guest speakers and listservs.

Methodology and Results

Students are working with other students, teachers, parents, volunteers, and administrators to design schoolyard habitats and inform concerned publics involved with the schoolyards. Student work includes research, analysis, and information gathering; planning and design; implementation and action; and sharing, reflection, evaluation, and recognition.

Since 1999, Clemson University students have completed designs for eight elementary and high schools throughout the state. The various designs emphasized xeriscape (water conservation), tree planting for energy efficiency, appropriate plant selection and planting techniques, low maintenance, wildlife habitat, literature gardens and outdoor learning environments that are responsive to both site and user needs. Guest lecturers and critics included teachers, parents, students and administrators from the schools and experts from various organizations.

The importance of diversity in building learning communities was illustrated by involving a wide range of individuals from disciplines including a sociologist from "Landscapes for Learning" (a university collaborative that promotes environmental stewardship and education through greening school grounds), an agronomist from the South Carolina Native Plant Society, a city planner from Upstate Forever (a non-profit organization that promotes sensitive city planning), several landscape architects from Clemson University, two architects from Greenville Technical College, an urban forester from Clemson University, and an urban forester from Myerscough College in Lancashire, England. These professionals provided direction, feedback,

and evaluation on issues ranging from master planning and design to tree protection at points throughout the design process.

One result of these interactions was the opportunity for students to practice oral communication skills in both formal (classroom), and informal (schoolyard) settings. Students had multiple opportunities to practice their presentation skills by presenting their work to various groups and individuals including parent teacher organizations, planning committees, television crews, reporters, and colleagues at professional society meetings. The professionalism evidenced in the student's work and presentations helped them gain media attention, and they have been featured on television and in the press.

Students working on the project also had opportunities to sharpen their written communication skills, as well as learn design principles and technical skills for multimedia document development. Students enrolled in First Year Composition researched and wrote about environmental issues, posted papers to their Web site and presented reports at sustainability events. These first-year composition students were able to conduct research that third-year horticulture students turned into professional poster presentations as part of their design work. These poster presentations were then published on the Web for the first-year students to view.

In their first two semesters of college life, these freshmen students had an opportunity to learn about writing for an authentic audience and experience the transformative powers of communication and collaboration. For an in-depth look at student designs, posters, PowerPoint presentations, brochures, and reaction papers, visit the following Websites which illustrate the wide range of written, oral, and graphic communication skills developed by students at work on this project.

http://virtual.clemson.edu/groups/hort/courses/sustainable_schoolyards/Designing_SSHs/dssh_ind.html

http://people.clemson.edu/%7Eblongo/sustainability/susmain.html

Professional Communication students enrolled in a graduate English class researched funding sources, wrote letters and proposals requesting funding for the project and obtained donations of tools to help with project installation. These students participated in the project by identifying potential community donors or grant-funding agencies and writing proposals for support. Using email, the students were able to contact horticulture professors to gather the details they needed to write their grant proposals and donation letters.

In one semester, the appeals resulted in in-kind donations of tools and supplies for the project from a local hardware store, as well as bulbs and an offer of sapling trees from regional associations. Thus, these students not only sharpened their critical thinking and communication skills, they also experienced the satisfaction of seeing some of their work result in tangible benefits for their community.

The benefits and outcomes of this project have reached beyond the horticulture and writing classrooms. Students, faculty, and community members have come together to extend learning far beyond the classroom walls. For example, English and horticulture students wanted to put what they learned into action, and some helped with phases one and two of the sustainable courtyard installation at an elementary school. They later continued to corresponded extensively through an electronic work environment, sharing ideas and files.

Reflection and Celebration

Reflection and celebration are also important aspects of service learning. As an example, after serving on two different design teams in separate landscape design classes, two students became self motivated and elected to further their learning and the project by using it as the focus of their senior honors research thesis. One presented her final project at the American Society for Horticultural Science professional society meeting and the other wrote a book entitled "Children and Landscapes: Environmental Education and Childhood Development". The two students won the 2000 and 2001 Clemson University Service Learning Award for their work on the project.

CONCLUSIONS

"The goal is to help students constantly critique, evaluate and build on knowledge and move to intellectually 'higher ground' and, at the same time, continue to critically examine their roles within our complex and diverse society." (Cone & Harris, 1996 p.41). Using service learning methodology, institutions of higher education and K-12 schools are meeting, communicating, and working toward common goals while contributing to the personal and intellectual growth of both students and the community.

With supervision from teaching faculty and help, inspiration, and guidance from non-profit organizations like Campus Ecology and the National and South Carolina Wildlife Federations' Schoolyard Habitat Programs, students are providing the link to benefit schools, universities, surrounding communities, and most importantly, the students themselves. They are learning about research, design, ecology, sustainable lifestyles and

landscapes, oral, written, and graphic communication, collaboration and electronic media. They are also learning to become citizens of a world outside the classroom through their meaningful collaboration with other citizens of that world.

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BREAKING DOWN TRADITIONAL DISCIPLINARY BOUNDARIES IN THE CLASSROOM

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INTRODUCTION

Typical institutional separation of academic fields often makes it difficult for students to grasp the intimate connections that exist between mathematics and its applications in other disciplines. To help clarify such connections, a library of interactive, Web-based learning modules linking important mathematical topics with contemporary applications in various fields was developed.

The library of modules covers the mathematical areas normally studied by undergraduate students, including calculus, linear systems and probability and statistics. The same modules are also used in many of Rensselaer's science and engineering courses at all levels, from the freshman to senior year. Linking subjects in this way has provided critical connections across disciplines and has also provided longitudinal subject reinforcement as students progress in their studies.

The 40+ modules developed to date are used each semester in numerous mathematics, science, and engineering courses at a variety of institutions (colleges, high schools and industries). The modules described here are part of Project Links, a National Science Foundation supported undertaking based at Rensselaer Polytechnic Institute, with collaboration from the University of Delaware, Hudson Valley Community College, Siena

College and Virginia Polytechnic Institute and State University.

Included in the above effort is an innovative and comprehensive evaluation program to assess the viability and effectiveness of the modules. For this, Rensselaer collaborated with The Evaluation Consortium from the University of Albany School of Education.

The library of modules, and how they are used, reinforce many current ideas on how to successfully integrate technology into the learning environment. According to the National Research Council Committee on Developments in the Science of Learning, there are five ways that technology can be used to establish an effective learning environment--by using real world problems, by providing scaffolding support, by increasing feedback, by building communities of learners and by expanding opportunities for teacher learning (Bransford, et al., 1999). All of these are central components of the project.

Similarly, the project closely reflects the criterion measures identified in the National Science Education Standards (National Committee on Science Education Standards and Assessment, 1996). For example, Science Education Program Standard C states, "The science program should be coordinated with the mathematics program to enhance student use and understanding of mathematics in the study of science and to improve student understanding of mathematics" (p. 214). This is one of the core objectives of the project. A detailed comparison of how Project Links aligns with the standards set by this group, the National Science Education Standards for Teaching, the National Council of Teachers of Mathematics Content and Process Standards, and the International Society for Technology in Education Standards for Students can be found at the project Web site (Project Links, 2001).

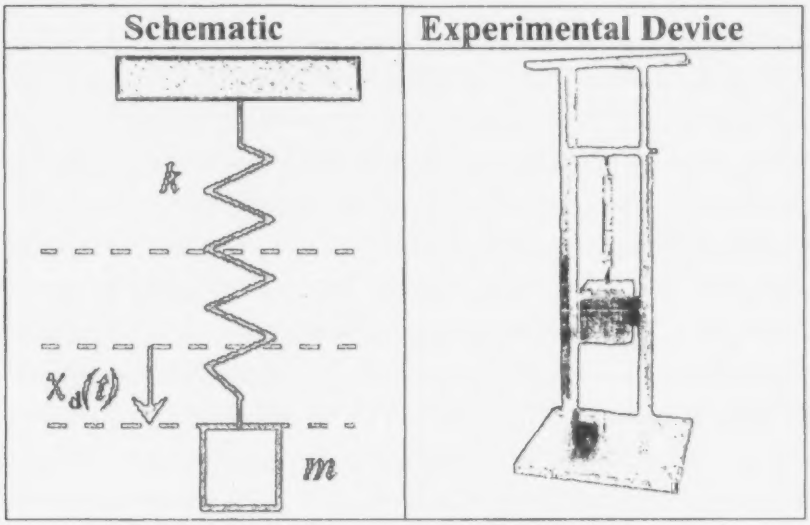
MODULE DEVELOPMENT PROCESS

The modules are designed for small-group student interactions with an instructor nearby. They are a self-contained conceptual unit, intended for use over one to three days in the normal course of the term. They rely heavily on hypertext construction, animations, and interactive Java applets. However, a complete module also includes an Instructor's Manual, which presents the design intent of the module, recommendations for use in the classroom, and handouts designed to accompany the interactive module. The research and teaching staff have found that the handouts, which are mostly worksheets based on the module subject matter, are a critical component of the learning process in the classroom.

Many questions and examples in each module are purposely left open-ended to encourage communication and self-discovery. They are also designed to encourage students to think creatively in how they approach problem-solving and how the concepts developed are transferable to related situations. This is done, in part, by providing multiple contexts for learning the underlying concepts, and having the examples that are used in the modules based on real-world situations. To achieve this, the developers incorporate actual experimental results, demonstrations, or design problems. The modules use videos, real-time experiments run over the Web, animations of experimental results, and data-reduction.

A typical example illustrating the above ideas can be found in the Spring Mass Module in which students study the dynamic behavior of a weight at the end of a spring. A schematic of this system is shown in Figure 1 along with the experimental apparatus used to generate data for this problem.

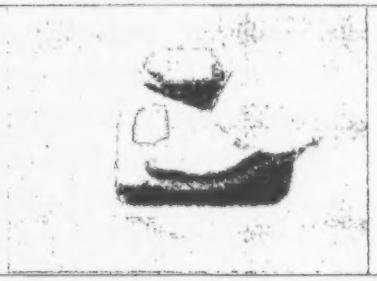
Fig 1. Problem Investigated in Spring Mass Module.



After analyzing the mathematical and physical problems for this system, students are given the objects and questions shown in Figure 2. Each picture is a link to a video showing common objects exhibiting the dynamic behavior of a spring mass system.

Fig. 2. Common Objects/Spring Mass Behavior

	A cyclical force is being applied to the fork of the bicycle. Is there a spring, a damper, or both inside?
	All the branches of this tree are moving with their own directions and amplitudes. Can the tree be modeled as a single spring or should it be considered a system?
	This office chair stays upright until you push on it. How much force do you need to apply to lean the chair back?
	A car's suspension uses a spring and a damper together. What kind of damping does the suspension provide: Coulomb, viscous, square law, or structural?

	The dial on this spring scale is linear, but is the spring? How accurate is the scale at recording relatively high or low weights?

Based on what they have learned in the module, students are asked the following:

Which of these examples are forced spring mass systems?

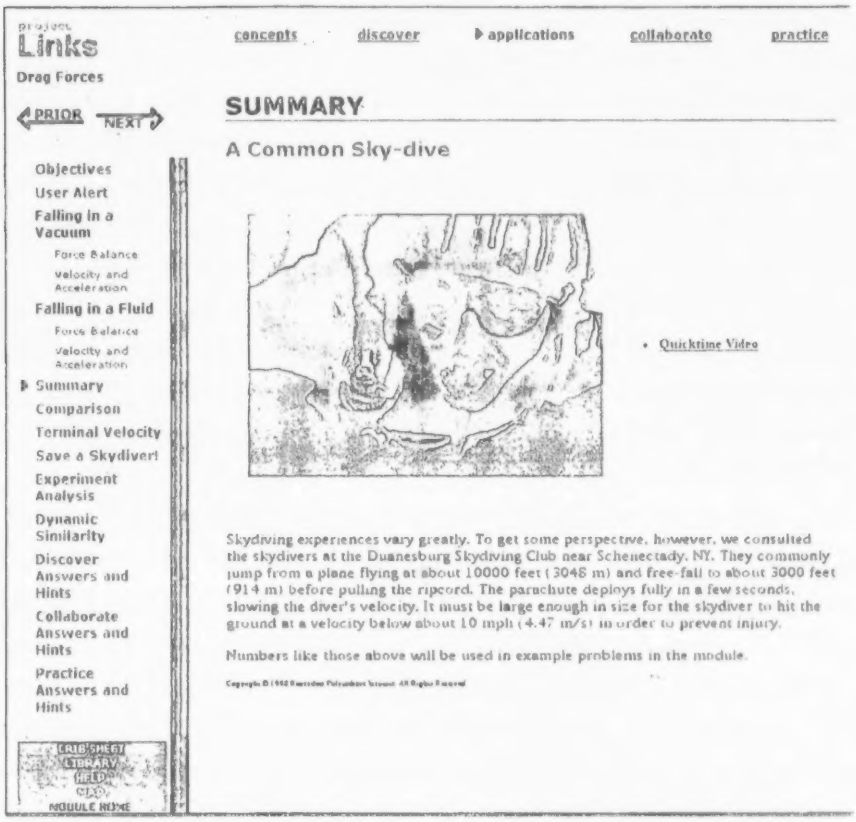
Which show significant damping characteristics?

When modeling these systems, what assumptions must be made to simplify while maintaining essential characteristics in the model?

Module Page Layout

A page from one of the modules is shown in Figure 3 to illustrate the content and functional navigational schemes. In the upper left hand corner is the PRIOR/NEXT arrow buttons. This is the path through the module the authors recommend in normal use. The pages used in this path are explained in the materials made available to the instructor. Along the left side of the browser window is the content navigation bar (Objectives, ..., Hints). This is a clickable list of the main module topics and sub-topics. Each of these may also be reached when using the PRIOR/NEXT arrows, but this list allows the student to jump around, as one would skip through parts of a textbook. A triangular icon appears next to the current topic shown in the frame.

Fig. 3. Typical Module Page Illustrating the Layout and Navigational Systems Used.


project
Links
Drag Forces
concepts
discover
applications
collaborate
practice
PRIOR
NEXT
SUMMARY
A Common Sky-dive
Objectives
User Alert
Falling in a Vacuum
Force Balance
Velocity and Acceleration
Falling in a Fluid
Force Balance
Velocity and Acceleration
Summary
Comparison
Terminal Velocity
Save a Skydiver!
Experiment Analysis
Dynamic Similarity
Discover Answers and Hints
Collaborate Answers and Hints
Practice Answers and Hints
CRIB SHEET
LIBRARY
HELP
GLOSS
MODULE HOME
Quicktime Video
Skydiving experiences vary greatly. To get some perspective, however, we consulted the skydivers at the Duanesburg Skydiving Club near Schenectady, NY. They commonly jump from a plane flying at about 10000 feet (3048 m) and free-fall to about 3000 feet (914 m) before pulling the ripcord. The parachute deploys fully in a few seconds, slowing the diver's velocity. It must be large enough in size for the skydiver to hit the ground at a velocity below about 10 mph (4.47 m/s) in order to prevent injury.
Numbers like those above will be used in example problems in the module.

Along the top of the browser window in Figure 3 is the functional navigation bar, used to branch off of the main topic areas. There are five choices available to the developer during design of the module. They are *Concepts, Discover, Applications, Collaboration,* and *Practice.* Any or all may be used from any one page. Again, a small triangular icon appears next to the current branch. Concepts are main topics, usually those that appear on the side navigation bar. Discover pages lead to questions or exercises that allow the student to explore a new area with information acquired from the Concepts pages. Applications are current uses of the topic in real-world situations. Collaboration supplies challenges that must be

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solved with a partner or by discussion between groups, perhaps with instructor guidance. Practice contains problems that the student must answer to allow the instructor to assess the learning that has taken place. These can have the form of pencil-and-paper worksheet problems, applets, or online submissions.

Towards the bottom left corner of the browser window in Figure 3 is a listing of reference or help pages. Four pages are available to the student at all times from anywhere in the module, as listed below.

> ***Cribsheet**--a summary of important concepts and formulas used in the module.*
>
> ***Library**--a list of the multimedia elements and major concept pages included in the module and a link to the site-wide glossary.*
>
> ***Map**--a conceptual map of the module material and/or a site map (the Hyperbolic Tree allows for dynamic links to anywhere in the module).*
>
> ***Help**--help files for students, instructors, installation and technical tips, and known issues and incompatibilities...the front page of any module can always be reached by clicking Module Home at the bottom of the side navigational bar.*

Module development is the responsibility of three teams, which work closely together--the content experts, the technical group, and the external evaluators. The content experts are two to four faculty, at least one from mathematics and one from outside mathematics. The technical group, which includes HTML and Java programmers as well as an interface design expert, is responsible for implementing the content and maintaining

the Web site. The evaluators are responsible for carrying out the various external assessment tests described later in the paper. There is also a small select committee consisting of members from all three groups which oversee aspects common to all modules. Commonalities include the interface design, navigation capability and the functionality available in the modules.

Content Experts

Content experts—faculty--provided exceptional ideas for subject matter but required time to learn how to communicate effectively with the other teams. One of the primary communication issues with the technical group centered on the construction and use of storyboards in developing multimedia modules. When working with the evaluation team, faculty needed to learn the reasons and benefits of formative assessment as well as the value of an observer visiting the class when the module is used.

To help with all of the above, several workshops were conducted, in which the module development process was outlined and participants learned how to develop collaborative teams involving faculty outside their own departments. Interestingly, it was relatively easy for the faculty to find common ground on which they could develop materials for their respective courses. This common ground consisted of an interest in educational innovation, an ability to think a bit differently on what is or is not important in the discipline, and the willingness to discuss this in a group setting.

To supplement this effort written materials detailing the steps and outcomes for good module development were developed. Nearly all faculty stated at least once that the best way to learn how to develop a multimedia educational module was through an example or model. The items provided to them in this regard are listed below and all are

available on the project Web site (Project Links, 2001). They were required reading for any and all who participated in the project.

***Design Questionnaire**--A questionnaire to help organize module content and ideas, including storyboard guidelines.*

***Module and Template Overview**--Overview and description of a Links module and the Links Template.*

***Development Process**--Explanations and resources to help develop a Links Module, including a description of the Links navigation scheme.*

***Developer Resources**--Information about the resources available to developers, including programmers, general resources and media tools.*

***Copyright Policy**--Steps to take in protecting the project material and that of others.*

***Navigation Scheme**--Explains differences between functional and content navigation.*

Storyboard Examples

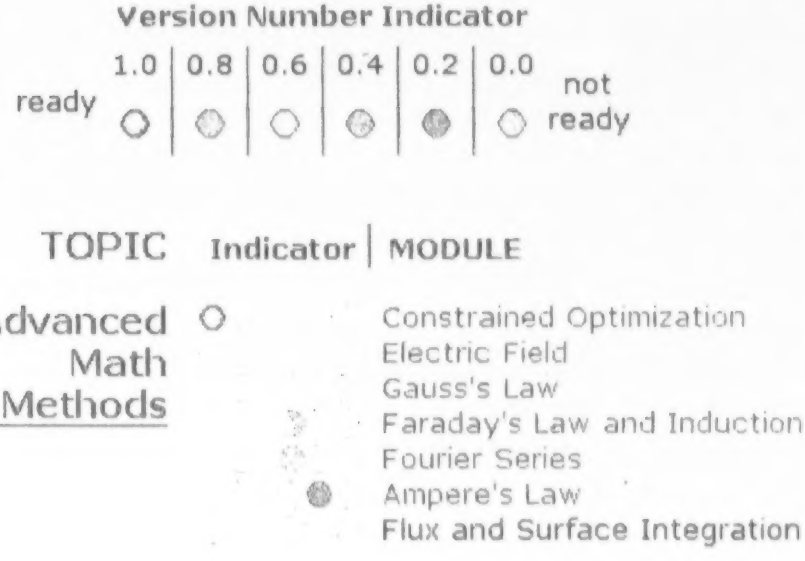
Applet Storyboard Example

ASSESSMENT

Each module had to pass through a rigorous assessment program, involving both internal and external evaluations. To identify the progress of a module through

this process, a version number was assigned to each module-- these are shown in Fig. 4.

Figure 4. Version Numbers, and Indicator System, Used to Identify Progress of Modules Through Development Process.



In Table 1 the various scales are described.

Table 1. Module Version Numbers and their Meanings.

Version	Description
0.0	Module is currently just a concept and is **not publicly accessible**.
0.2	Module is in **prototype format** and is publicly accessible.
0.4	Module is **partially developed** and not yet evaluated.
0.6	Module is completed in the Project Links standard format and is **ready for internal alpha and beta testing**.
0.8	Module has passed the internal alpha and beta testing and is **ready to begin external evaluation** for content, usability, and the appropriate use of educational technology.
1.0+	Module is **released for public use**. It is in the Project Links standard format, has been evaluated for content, usability, educational technology. It has been revised to reflect changes recommended via the evaluation process.

Alpha Testing

Alpha and beta tests are conducted by the Interface Designer, who is a member of the technical group. As a part of the Alpha tests, the interface designer checks modules on all platforms and browsers for broad editing, aesthetic and usability issues. Review includes checking for the following:

> ***Broad Issues****--consistency with the Links format, logical use of the content and functionality*

navigation, general usability, bugs/technical problems with the animations, videos, applets, etc.

***Editing Issues**--titles accurate, links broken, pages missing or incorrectly named, clarity of the text, clarity of graphics/charts, etc.*

***Organizational Issues**--how is the material presented? Does the module make sense? Can there be more interactivity? Is the medium used effectively?*

***Aesthetic Factors**--does the module look good? Can it look better?*

Beta Testing

The interface designer provides a fine-toothed copyedit for grammar, punctuation, misspellings, broken links, broken applets, etc. Beta testing also ensures that the design and usability look good and work smoothly.

The Evaluation Consortium conducted the formal external assessment. This group standardized the process and implemented the evaluation plan. Four types of testing were designed and/or conducted--the Content Review, Usability Testing, Educational Technology Review, and Pilot Testing/Classroom Observation. These are explained below followed by some of the findings.

Usability Testing. A small number of students are asked to use the module and provide information pertaining to usability from a student's point of view. An observational checklist and interview protocol is used which includes videotaping students while using the module.

Educational Technology and User Interface Review. This is a standard review that looks at the module

from a technological and instructional point of view and provides validation of the module's appropriate use of current learning theory. A written review is provided based on a checklist of instruction design concepts.

Pilot Testing and Classroom Observation. This involves classroom observations and semi-structured interviews with students. The objective is to determine how well the module accomplishes its intended tasks (To date over 1000 students have been observed and interviewed. Data have also been collected from multiple institutions, as well as multiple mathematics and non-mathematics courses--approximately 50).

Content Review. Once the module has been developed to the satisfaction of the authors and the technical manager, a qualified expert in the subject matter is found outside of the developing institution and provided with a checklist. In general, content reviewers are asked to work through the module, validating the module content and the accuracy of the materials presented. They are asked to complete a short review of the module delineating content viability.

EVALUATION FINDINGS

Findings from the evaluation program obtained from student perceptions of module usage are presented below. For comparison, the results for the 1998-1999 and the 1999-2000 academic years are presented to indicate the affects of improvements made in the modules based on the first year assessment. The data reported are from all modules used during the indicated years and includes both mathematics and non-mathematics courses. A full report of the assessment results can be found in Newman, et al. (2000).

Relevance of Module

One issue addressed was the perceived appropriateness and relevance of the module content. This information was gathered using in-class observations, paper-pencil surveys and semi-structured interviews. The results are given in Table 2.

Table 2. Student Perceptions of Module Relevance; Values are Percent of those who agree.

Module Content	1999-2000 (n=436)	1998-1999 (n=580)
Information presented in the module is relevant to course content	95%	86%
Information presented in the module is useful	93%	67%
Information presented in the module is relevant to academic area	91%	68%
Information presented in the module is easy to understand	91%	68%
Information presented in the module is well organized	91%	66%
Content of the module is of interest to students	88%	64%

From the data it may be seen that there is a marked increase in the second year in the percent of students who

perceived the modules as relevant to the coursework and relevant to the academic area. What is significant is that this is true whether or not it was a mathematics course. There were also marked increases in all other surveyed responses in this category. This is strong evidence that the students consider the modules to successfully bridge multiple disciplines and break down the disciplinary barriers commonly found in such courses.

Perceived Cognitive Outcomes

A second assessment issue was the students' perceived cognitive outcomes from using the modules. This information was gathered using paper-pencil surveys and semi-structured interviews with students. The results are given in Table 3. From the responses it is clear the students have a strong perception that the modules facilitated learning of the content in a variety of ways. There was also a marked increase in all categories in the second year.

Table 3. Student Perceptions of Cognitive Outcomes; Values are Percent of those who agree.

Module Use	1999-2000 (n=427)	1998-1999 (n=574)
To think about problems in graphical/pictorial ways	95%	77%
To recall course content	92%	64%
To apply course content to new problems	92%	62%
To improve grades	89%	40%
To develop skills in problem solving in the content area	86%	58%
To develop different ways of solving problems	86%	58%
To work collaboratively with fellow students	85%	68%
To transfer knowledge to problems outside the course	85%	48%
To become motivated to learn course content	83%	40%
To develop attitude of self-direction and self-responsibility	81%	45%

Two items of particular interest are that 92% agree using the modules helps them to apply the course content to new problems and 85% agreed that the modules help to

transfer knowledge to problems outside the course. The ability to transfer concepts and methods to new situations is critical in a student's educational development and it is significant that they consider the modules successful in helping them with this.

When the students were queried as to the benefits of using the modules, they reported a variety of direct cognitive benefits, including enhanced learning and problem solving skills. More specifically, students reported that the modules provided practice with the use of collaborative skills, hands-on/real world applications, and different types of problem solving methods.

Faculty reported multiple positive cognitive outcomes resulting from module use. These included greater understanding of course concepts, making connections between mathematics and science concepts, and developing problem solving skills.

Perceived Affective Outcomes

A third assessment issue was the perceived effective outcomes of the modules by the students. This information was gathered using paper-pencil surveys and semi-structured interviews with students. The results are given in Table 4. As with the other two categories, the responses in 1999-2000 are quite positive and, in this case, are approximately twice that was observed the year before.

Table 4. Student Perceptions of Affective Outcomes; Values are Percent of those who agree.

Affective Outcomes	1999-2000 (n=436)	1998-1999 (n=580)
My knowledge has increased as a result of the modules	99%	58%
My confidence in the course area has increased because of the modules	94%	47%
Module content is motivating	94%	42%

CONCLUSIONS

The assessment results from 1999-2000 provide strong evidence that from the student point of view that the modules are accomplishing what they were designed to do. In particular, the modules were found to successfully bridge multiple disciplines and break down the disciplinary barriers commonly found in the mathematics and non-mathematics courses. Moreover, the modules were found to help apply the course content to new problems and to help transfer knowledge to problems outside the course.

It is also evident that significant improvements were made between the first and second year. This observation generates the question--*what exactly was done to achieve this improvement?* To shed light on this question, a partial list of the changes made in the program is given below. All of the changes have potential for being important factors in achieving the improved student responses in the second year.

***Content Improvement**--all faculty received assessment reports of the modules and they then spent the summer making improvements based on this information.*

***Technology Upgrade**--the modules push the technological envelope and the laptops used in the second year were significantly better than those used the first year.*

***Worksheets**--even with interactive computer materials involving collaborative projects, the addition of pencil-and-paper worksheets that the students completed as they worked through the module appear to have helped them to more actively engage with the subject matter.*

***Instructor Workshop**--a workshop was held for the instructors to help them develop effective methods and clear objectives when using their modules in class.*

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CREATIVITY AND TECHNOLOGY:

TEACHING THE PSYCHOLOGY OF CREATIVITY

AT THE TECHNICALLY ORIENTED UNIVERSITY

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University of Advancing Computer Technology

INTRODUCTION

In many respects, the reward system of society seems to require creativity. For example, doctoral degrees, grants, and fellowships are usually awarded only for projects judged to be creative. Job announcements for managers and professionals in many fields routinely describe the company as "innovative" and call for applicants who are creative. In the United States and elsewhere, candidates for political office generally must appear to have creative solutions to public problems.

Creative problem solving was initially applied to industrial problems. Corporations that used the creativity process were able to reduce costs, increase profits, and better utilize their human resources and increase their share of market sales. It was quite easy to measure improvements in an industrial setting, more so at the lower end of the corporate structure.

No wonder, then, that there are a host of organizations and works dedicated to analyzing and encouraging creativity in our society. Most obvious perhaps are the hundreds of art and technology museums around the country that display, educate, and advocate creativity.

Almost all universities and centers for advanced research perceive themselves as "advancing the frontiers of

the known" and fostering creativity as well as discovery; some universities have specific interdisciplinary programs on creativity. Interestingly, while one can search high and low for a category called "creativity" in grant listing, many foundations, like the Carnegie, Ford, Rockefeller, MacArthur, and Lemelson, are committed to supporting creativity in various guises. And, there are countless workshops and courses on: creative writing, creative cooking, creative management, creativity in relationship, and creativity itself.

WHY TEACH CREATIVITY?

The word "creativity" became common only after World War II. As Frank Barron (1969) has written, the American government's cold war political and military concerns, the business community's belief that innovation would lead to profit, student centered educational reforms, and the fact that psychologists turned away from a focus on neurosis and disease toward a picture of mental health all contributed powerfully to the intellectual interest in creativity at mid-century. This intellectual interest in the subject, coupled with the broader economic, political, and cultural forces have shaped how most of us now view creativity.

A number of educators brought creativity into the classroom. In 1970, for example, the Purdue Creativity Training Program for schools (Beck, 1997) was introduced. About the same time, universities began to offer courses on creativity and even creativity studies. Interest grew in Europe also. In 1966 the Jungian-oriented Eranos Center in Switzerland hosted an interdisciplinary international conference on creation and formation. By 1990, at the International Conference of Creativity in Buffalo, 'Creatology" was proclaimed a unique discipline by Istvan Magyari Beck (1997).

In higher education, although professing interest in creativity, traditional educational methods may be summarized as follows:

Lectures overloaded by information, which force students to accept it passively

A teacher-centered approach, not a student-centered one

Teaching approaches that stress conclusions and underestimate processes

Emphasis on convergent thinking and neglect of divergent thinking

Stressing logic and debasing intuition

Students generally find the basic academic subjects threatening or dull; their chance of using their minds in creative ways comes from working on the student paper, the drama club, or the orchestra. Innovation of education has to involve new models that stimulate a student's curiosity and foster their competence in creative way. So if the next generation is to face the future with zest and self-confidence, they must be educated to be original as well as competent.

Scholars across the world are engaged in the development and implementation of new courses and programs on creativity. In Romania courses on creativity have been introduced for undergraduate and graduate students majoring in psychology or education (Stoica-Constantin, 2001). New creativity projects have been launched by primary and high schools throughout South Africa (Neethling, 2001), Argentina, Peru, Spain (Romo, 2001). Asian countries have been implementing new

thinking processes for their human resources in research, manufacturing, education, and community environment. The Prime Minister of Singapore has established a national policy of "Thinking School and Learning Nation." In England, Sir Ernest Hall has created the Creativity Center Educational Trust to promote creativity in education, industry and government. The Brazilian Creativity Foundation was opened in late 2000 with approval of the Brazilian government (Socha, 2001).

These are examples of the serious attention given within various countries to the concept of creativity and the necessity of creative problem solving as well as thinking-skill development. Creativity is coming to be recognized as a legitimate academic discipline (Bleedorn, 1998).

Infusing creativity in technology curriculum is regarded as an innovative initiative. Facing radical global changes in economical, political, and societal fields, educators all over the world start to realize that the theme of creativity will be a keyword for the next generation. Technology has moved the traditional focus of education on memory storage to the cultivation of talents for processing the overwhelming supply of available data in ways compatible with the systemic reality of the complex world.

CREATIVE ENVIRONMENT: CHARACTERISTICS OF THE UNIVERSITY OF ADVANCING COMPUTER TECHNOLOGY

The author has one year experience teaching the "Psychology of Creativity" at the University of Advancing Computer Technology. University of Advancing Computer Technology is an Arizona corporation, established in 1983. The university provides technology education at the collegiate level. It delivers advanced training, education and research in multimedia, web development, animation,

computer game design, 2D and 3D interactive media, software engineering, network engineering, Internet administration, application development, computer programming, computer aided design, mechanical/ industrial design, architectural/civil design and related technologies.

The school's mission is to seek and apply innovative teaching strategies. One of the highest achievements for the past five years has been the development and successful application of the hyperlearning method.

CREATIVE TEACHING: DISCOVERING NEW METHODOLOGIES

In various observational studies psychologists found that the professor's lecture occupied nearly 80% of the time. To counteract this passive form of learning, in colleges and universities throughout the world, efforts are under way to transform the classroom from a lecture-based experience to a more active and demanding one for students.

University of Advancing Computer Technology has researched and developed a teaching methodology called hyperlearning to enhance information retention among students. The building, classrooms and furniture accommodate the different styles of teaching facilitated by the instructors. The physical layout supports hyperlearning with open learning areas, electronic classrooms, computer commons, lecture rooms, studios and group areas equipped with the latest computers and presentation software.

The university uses the hyperlearning educational model to increase knowledge, improve retention, foster team-building and problem solving skills, and develop creative thinking and leadership skills in an industry-oriented environment. Within the hyperlearning

methodology, students experience lecture, instructor-led tutorial teaching, self-directed tutorial teaching, group recollection, and student teach-back as regular components of their educational process. The student learning environment is typically comprised of lecture, hands-on computer study, team-building projects and distance learning courses via the Internet.

The hyperlearning teaching model embodies five learning methods:

> ***Lecture**--traditional instructor-led presentation and testing typically accomplished in learning areas, classrooms or the theater*
>
> ***Tutorial Teaching (instructor-led)**--highly directive teaching where the student integrates learning with hands-on activities typically accomplished in electronic classroom at individual workstations*
>
> ***Tutorial Teaching (self-directed)**--self-paced, learner-directed and interactive learning*
>
> ***Computer-Based-Education**—and Internet technologies are typically accomplished in the Computer Commons*
>
> ***Group Recollection**--one of the most effective methods for information retention is the act of recalling and applying information in small groups (produces up to 90% information retention). This team approach is typically accomplished in the Computer Common, studios and group learning area*

***Student Teach-back**--Students teach portions of the "learned" material (or new material) back to the rest of the class typically in learning areas, studios, and the theater.*

Such processing enables learning groups to focus on group maintenance, facilitates the learning of social skills, and ensures that members' develop skills required to work cooperatively. Some of the keys to successful processing are:

Allowing sufficient time for it to take place

Making it specific rather than vague

Varying the format

Maintaining student involvement in processing

Reminding students to use their social skills while they process

Ensuring that clear expectations of the purpose of processing have been communicated

Often, each group is required to turn in a summary of their processing that is signed by all group members.

Why group activities?

People collaborate because they don't know how to (or can't) deal effectively with the challenges that face them as individuals. There's uncertainty because they genuinely don't know how they will get from here to there. In that respect, collaboration becomes a necessary technique to master the unknown.

John Dykstra (1999) has redefined the field of movie special effects through his pioneering work in computer-controlled camera shots in such films as "Star Wars". His job is, quite literally, to create things that people have never seen before. His intergalactic images of hyper-space and exo-biological fauna are products of an intensely collaborative environment. By linking technologies in unanticipated ways, the images on-screen create a new set of realities that both the eye and mind find completely believable.

When he talks about the creative process, Dykstra could be describing collaboration at a top-notch research lab, an advertising agency, a law firm, or any organization confronting a new challenge: "You're trying to create something together that you don't know. So you try to get a communal mind going; you want to get people's minds to interact as components of a larger mind--one person's logical sense, one person's visual sense, another person's acoustic sense. You get a communal brain. What matters is not just the individual talents but the ability to integrate them" (Dykstra, 1999).

What is so striking about the range of collaborations in the arts, the sciences, and in business is the way that the collaborative relationship seems to transcend age, gender, temperament, energy level, nationality, and the thousands of idiosyncratic quirks to which humans are heir. The collaborators possess a medium of mutual trust, the belief that they are each adding value, and a genuine desire to solve the problem at hand or create something new.

THE PSYCHOLOGY OF CREATIVITY COURSE: ACHIEVEMENTS AND CHALLENGES

As was mentioned earlier, there is now a growing interest in creative behavior--creative corporations, creative writing, creative thinking, creative leadership, and so on.

There is a huge demand for better ways of performing, producing, advertising, administrating, educating. In a highly competitive environment in order to survive--businesses, artists, scientists, leaders need something in common, no matter in what areas of interest they are involved. That is why teaching of creativity becomes as important as teaching of critical thinking.

The three credit course "Psychology of Creativity" mentioned earlier uses a textbook "Psychology of Creativity," a Study Guide, and CD. These materials include an historical overview of research and approaches to creative behavior, characteristic of the psychological components of creativity, application in wit, writing process, visual arts, science, business and leadership, and various techniques for creativity stimulation.

Teaching creative behavior requires a creative approach on behalf of the instructor. The author and colleagues developed supplementary material that help to present instruction using technological tools (Power Point, Flash, Corel Draw, Photoshop, Page Maker, Internet links), to demonstrate various techniques for creativity stimulation and to develop new applications for creative behavior.

During this course students are required to read the textbook, follow the Study Guide instructions that show practical techniques for creativity stimulation and work individually or in groups preparing the Final Project. Their Final Projects need to show practical application of creativity.

For example, one group of students had developed the software that helps to apply Mind-mapping technique for idea generation as well as for teaching various subjects. One student had prepared an exhibition of visual images that were composed of only two elements of the same size--circles and ovals (doodles). Another student had monitored her creative activities for 30 days and showed how studying the course "Psychology of Creativity" stimulated her

creative behavior. She presented 30 pages of Maps for Philosophy, Religion, and Art issues that she created during 30-day-monitoring. One student started his own business on creativity education and training. He developed a business plan, mission, goal, and implementation of his creative ideas for education and training in various settings: business, leadership, arts and education, as well as for people in general.

Student evaluations of the course showed great interest and positive influence on students' performance in the rest of their courses. Students stressed that the course in creative behavior should be offered early in the program--in the first or second semester. They felt that such a course would help them to generate innovative ideas for their projects for many other courses at the university.

The success in teaching creativity expanded the interest in the subject beyond the university classroom. The university administration asked for a seven hour creativity workshop for the university staff. The workshop was held, it received many positive responses and aroused more demand for creativity implementation, particularly in the area of therapy. Responding to this demand a new course was developed and as a result the textbook "Therapy through Creativity" was published and has gained interest among psychologists and counselors.

CONCLUSIONS

The creative process is like a quest that takes a person down a spiritual trail. Prisig might say that the motorcycle that one is working on is oneself. Nietzsche would probably say that a creative act is the only way to eliminate despair and alienation. The Zen monk might say that one can find oneself by losing oneself in his or her art form. There is a meaningful, original authentic self inside everyone waiting to be discovered and expressed.

Creativity can be taught and needs to be taught. Knowledge of the creative process cannot substitute for creativity itself. It never hurts to be gifted, but at the same time giftedness and talents can be refined and increased through education and training.

Techniques for creativity development and stimulation do not have to be mysterious. For those trying to understand the universe or get at the "meaning of meaning" as well as those wanting to change the world, it might be important to know that changing the world is an inside job.

The experience of teaching a course entitled "Psychology of Creativity" shows great possibility for the further research, development, and implementation in higher education institutions. As Bleedorn (2001) pointed out, "If society and its political leadership are serious about educational reform, we will all 'get out of the box' of current curricula as usual and make room for the specific teaching of the high end thinking processes" (p. 68).

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TEACHING HYPERTEXT THROUGH POETRY

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INTRODUCTION

"Good morning, Class, and welcome to English 2010 Honors." The students look around nervously. We are meeting in a computer lab--and apparently this comes as a surprise to many. This is English?

"We're going to work together this semester to learn about writing in electronic environments--and we'll all produce Web pages rather than traditional print-based essays." I go on to describe for the class how new media are radically changing the way we communicate and how, to my mind, students in twenty-first century classrooms should be learning to read and write with media that were unheard of even a decade ago.

I help the students to log on to the computers, demonstrating procedures for them to follow via the LCD projector at the front of the lab. Together we explore the Web classroom that we'll be using as the site for our class's work during the semester, including the online student portfolios in which they will publish their writing. I show them where to locate the syllabus, bulletin board, description of assignments, and class calendar. We practice other Web tools such as the discussion forums and the chat rooms, tools that we will be using at various times and for a variety of purposes. Then, I turn to their first assignment, which I call a hyperpoem.

"What in the world is a hyperpoem?" I hear a student mumble under her breath, "Sounds like poetry on steroids." "Pretty close," I say.

I describe the assignment to them, emphasizing that we will use the hyperpoem assignment as a way to practice writing in a hypertext medium. I use poetry for this assignment because it is already layered with meaning and thus lends itself nicely to complex interpretations.

"You can use a poem that you have written, or you can bring any poem or song lyric you'd like to use for this project. Your job is to add your own interpretation to the existing text of the poem by using any other means possible: for example, linked documents, colors, fonts, text art, graphics, photographs, backgrounds, and so on. Use your imagination to visualize how the poem could be made more meaningful for the reader as a hypertext document rather than just as words on a page. Please look at the models I have linked from the class Website for ideas to help you get started. There are really no rules, just go for it!"

RATIONALE FOR THE TEACHING IDEA

In his provocative essay, Gunther Kress asks "what will the subject English need to become in order to function as an essential part of the education of young people?" (Kress, 1999, p. 66). He asserts that, although the common understanding of English currently is that it's a "language-based enterprise," the "landscape of communication is changing fundamentally" (Kress, 1999, p. 67). He argues persuasively that if English is to continue its relevance as a school subject, it needs to broaden the emphasis from language to incorporate the visual as well: "I suggest that the visual is becoming prominent in the landscape of public communication, and that this cannot be ignored by school-curricula" (Kress, 1999. p. 67).

Particularly in new media such as the Internet, Kress points out that "the visual is taking over many of the functions of written language" (Kress, 1999, p. 68). What

this means for English educators is that we cannot continue to ignore the informative functions of images, particularly as they are connected in ever-changing ways with texts and hypertexts on Internet Web pages. These are the texts that our students are interacting with in increasingly large numbers. It is incumbent upon writing teachers in the new millennium to help our students become intelligent users and producers of these media, including attention to the communicative function of the visual.

I designed the hyperpoem assignment to introduce students to the ways in which hypertexts, complete with graphics and other visual cues such as icons, colors, and fonts, can be used to convey meaning to readers. I start with a piece of writing that is already complete as a print-based document in order to focus the attention on the addition of other types of media to enhance the meaning of the words.

I'm always pleasantly surprised by how many students want to use a poem that they themselves have written, or one that they recall their parents reading to them in childhood, or even a favorite song lyric from a rock group or country music artist. They intuitively pick something that already has had an impact on them personally. Once they have decided on a poem and typed it into a word processing document, we're ready to begin learning about writing hypertexts.

We start out by actually looking at some model hypertext poetry, both from my prior classes and from Internet sites. One Web site that I really like as a way to help them visualize where we are headed with this assignment is called PoemsthatGo.com (2001). On their home page, this group states their mission: "Created to unite words, design, music and motion and to celebrate poetry through technology and the Internet." (PoemsthatGo.com). When students begin to explore the innovative, original poetry found at this site, I can almost

see their minds churning with ideas for their own hyperpoems.

PROCEDURES USED TO TEACH THE ASSIGNMENT

Students today come to our classrooms with quite sophisticated Internet skills--navigating their way through hypertexts, reading the words, viewing visuals, listening to audio clips, and interpreting the meanings of all of these various types of media. However, much of the time, they do so in an unreflective and perhaps even uncritical way. One of my objectives with this assignment is to help students think a bit more deeply about how meaning is created for readers (or by readers) of hypertexts, through their own attempts at creating them.

Students usually produce a first draft of the hyperpoems in about two weeks, with the class meeting twice per week in the computer lab for seventy-five minutes per session. The class is workshop-based in which I demonstrate a concept, tool, or skill to be learned via the LCD projector, and students then work at their own computers to follow through with the assignment.

For their first experience with hypertext, I use a Web-based HTML editing program (either Netscape Composer or Microsoft Word 2000). These HTML-editing programs make it quite easy for students to transform their word-processed texts into hypertexts; they always catch on quickly--and, in fact, oftentimes they already have written their own Web pages in other contexts, and they know far more about it than I do!

EXAMPLES OF STUDENT RESPONSES

Each time that I teach this assignment, I am astonished by the creativity of the students and their imaginative responses to the poetry they have chosen. I have selected only a few examples--and you'll have to imagine what these would actually look like if you were reading them on your Web browser. In this section, I'll use the responses of two first-year students who were in my university Honors Writing Seminar during the Spring Semester of 2000.

One of the students was planning to major in some field of art. You can see by the examples of her responses that she had an excellent sense of design as she worked on her hyperpoem. She chose a relatively difficult and lengthy poem by D. H. Lawrence called "Snake." (Lawrence, 1992). She spent most of her time working on the illustrations--backgrounds, colors, graphics--that all contribute to the impact of the snake poem. The secondary pages are complementary in color and design so that readers know they are still reading the same hypertext. They also provide a "back to poem" button to help readers with navigation. The font is large and readable, and the text is layered over the background so the words scroll but the background remains in place. Figure 1 is a screen shot of her poem's homepage.

Figure 1. Screen Shot, Student Homepage

Snake - Microsoft Internet Explorer provided by @Home
File Edit View Favorites Tools Help
D.H. Lawrence
A snake came to my water-trough
day, and in I came for the
heat,
To drink there.
In the deep, strange-scented shade of the
great dark carob-tree
I came down the steps with my pitcher
and must wait, for there was at the trough
before me.
Start
Snake - Micro
Teaching Hypert
Internet
10:39 AM

The linked secondary pages provide brief explanations of terminology and interpretations of the poem, including its impact on the author of the hyperpoem herself. She discusses the terms "slackness," "someone," "burning," "Etna," on the first page of the poem, among other terms or references that she felt might be confusing to readers.

After reading the student's responses and comments on the poem, I felt that she really had a comprehensive understanding of what D.H. Lawrence was attempting to communicate; at the same time, she was able to insert her own interpretations and responses, as in Figure 2.

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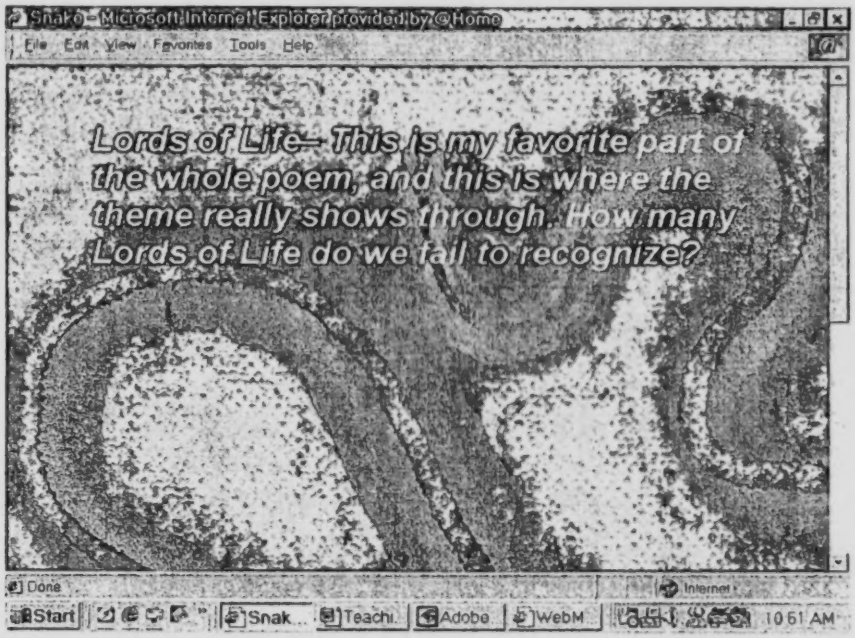
Figure 2. Screen Shot, Student Interpretation


Lords of Life– This is my favorite part of the whole poem, and this is where the theme really shows through. How many Lords of Life do we fail to recognize?
File Edit View Favorites Tools Help
Done
Start
10:51 AM

Another student in the same class chose a poem by Emily Dickinson. She was not quite as proficient at design as the first student, though she located and inserted an appropriate background photograph to illustrate "The Coming of Night" (Dickinson, 1993). What I especially liked about this hyperpoem, in contrast to the first student's, was the way in which she had researched both the author and the poem itself to help her readers better understand its context.

For example, her first link explains that Dickinson's poems were not published during her lifetime and that she rarely titled her poems. She also explains that this version was edited by a publisher prior to publication and therefore did not reflect Dickinson's original punctuation or line spacing. She also recognized that her own hyperpoem version was now placing yet another level of meaning onto

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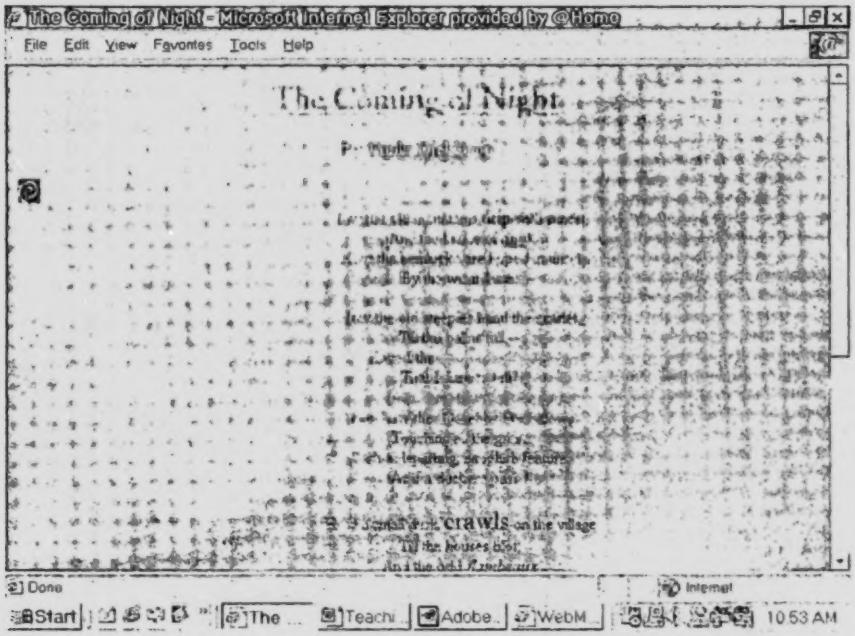
the original author's vision. Figure 3 shows this student's homepage. The underlined words and marginal icons indicate her links to secondary pages with commentary.

Figure 3. Screen Shot, Student Homepage



You'll notice that the poem is a bit more difficult to read, primarily because the font she used is quite small and the background very dark. She was trying to match the length of the poem to the size of the background picture--and didn't have the technical expertise needed to adjust the background the way the first student did. Ideally, she also should have dimmed the background somewhat so that the words stood out more clearly, again to enhance readability.

These are new issues to students who haven't ever thought of writing in such visual terms. On her secondary pages, because she wasn't so constrained for space, the student used a larger font--showing that she was aware of the problem and had remedied it where she could. Figure 4

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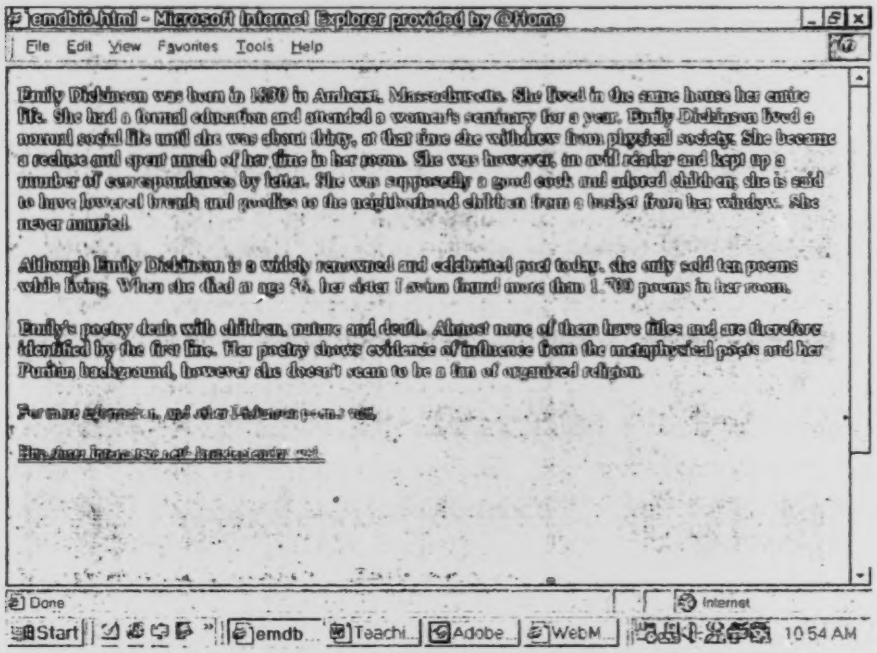
shows one of her secondary pages with comments about the poet.

Figure 4. Screen Shot, Student Secondary Page


emdbio.html - Microsoft Internet Explorer provided by @Home
File Edit View Favorites Tools Help
Emily Dickinson was born in 1830 in Amherst, Massachusetts. She lived in the same house her entire life. She had a formal education and attended a women's seminary for a year. Emily Dickinson lived a normal social life until she was about thirty, at that time she withdrew from physical society. She became a recluse and spent much of her time in her room. She was however, an avid reader and kept up a number of correspondences by letter. She was supposedly a good cook and adored children; she is said to have lowered breads and goodies to the neighborhood children from a basket from her window. She never married.
Although Emily Dickinson is a widely renowned and celebrated poet today, she only sold ten poems while living. When she died at age 56, her sister Lavinia found more than 1,700 poems in her room.
Emily's poetry deals with children, nature and death. Almost none of them have titles and are therefore identified by the first line. Her poetry shows evidence of influence from the metaphysical poets and her Puritan background, however she doesn't seem to be a fan of organized religion.
Done
Internet
Start
emdb...
Teachi...
Adobe...
WebM...
10:54 AM

These two examples are representative of the types of hyperpoems written in two weeks' time by first-year college honors students. They tremendously enjoyed the challenge of writing in this new medium--and appeared eager to apply the knowledge gained from this assignment forward into their other writing for the class. Each of their subsequent assignments, a persuasion piece, an argument Website and a collaborative hypertext, all built on the basic understanding of hypertext gained from the hyperpoem assignment.

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REFLECTION AND COMMENTARY

Readers may be wondering why this particular assignment with this particular class. My choice was based on two main pedagogical goals, which remain the focus of the assignment, not the technology or the literature: first, to give students an opportunity to learn first-hand about the tools for writing with new media; and second, to help students to begin thinking more critically and reflectively about how textual and visual elements interact in hypertexts.

By working on this assignment, students discovered that there was more to hypertext than how it looked on the screen; that there were important issues of structure, layering, links, possible paths, and navigation through a text. There is the question of whether the text should be author-driven or reader-driven, that is, whether the author forces the reader to read the text in a certain sequence by virtue of its navigation (author-driven), or whether the reader is able to read the text in any order, choosing his or her own path through the text (reader-driven).

These differing approaches create intriguing questions about interpretation and authorship. Who "owns" the text? Or, as the noted literary critic Stanley Fish once said: "Is there a text in this class?" (Fish, 1983).

In addition to the interesting structural questions, there are equally interesting interpretive questions raised by this assignment. By changing a text into a hyperpoem, how have you changed its meaning? If you are converting your own poetry into a hypertext, how is that different from using someone else's poem? What about composing directly for the hypertext medium? How does that affect meaning or author intentionality?

Because students are learning a great deal about where meaning resides in texts, how meaning is created or generated by readers and authors, they are at the same time

exploring issues of criticism and interpretation that are central to literary and critical studies. Even though this is not my primary purpose for the assignment, it is easy to see how it could apply in other English courses with other related pedagogical purposes.

I can imagine English teachers in a high school using this assignment as a way to help students write about literature that they are reading and studying. I can envision an elementary classroom in which students are writing original hypertext poetry. In a college class studying literary criticism, this assignment could help students to delve into important issues of interpretation and critique.

The main thing to remember is that students outside our classrooms are engaging with new media in myriad ways. As teachers, we owe it to them to help them understand how they are being affected by the new media they encounter in their everyday lives. As Kress (1999) suggests, we ignore these media at our peril.

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ACHIEVING COLLABORATIVE ADVANTAGE--

AN EVOLVING PARADIGM

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INTRODUCTION

The year 2001 began a period of strategic initiative and planned change for the traditional MBA program at Kennesaw State University. The changing competitive environment and declining enrollment figures necessitated a visionary approach to re-inventing a static program and its required components. This paper describes an integrative, team-taught, collaborative effort to develop and deliver business foundation courses for the part-time Career Growth MBA program, as a tool to initiate growth and change.

ACHIEVING INTEGRATED CURRICULUM SUCCESS

Pre-requisite knowledge for entry into an MBA program has long been an obstacle to admission for many non-business undergraduate degree recipients. Data (Green, 2001) show that in the period from 1992 to 1997 colleges and universities experienced an 11% decline in undergraduate business degrees awarded while master's degrees in management increased by 17%. The discrepancy in degrees awarded indicated that more non-business

degree recipients were now seeking graduate degrees in business.

MBA programs in the United States require as many as eight to ten foundational courses before a candidate can matriculate into the graduate program. Many students complete their degree programs part-time while working full time in career path employment, requiring 12 to 24 months before the official MBA program can be started. Addressing this enrollment hurdle and identifying a possible solution was seen as a strategy to gain higher MBA enrollments.

The Coles College of Business

The Coles College of Business at Kennesaw State University, like other business colleges throughout the country, requires entering MBA candidates to demonstrate certain foundation business competencies. Knowledge across the business spectrum is required in areas of management, accounting, marketing, statistics, economics, business law, technology and finance. Candidates have the option of developing these competencies through previous undergraduate coursework or foundation-accelerated non-degree coursework. Candidates considering entry into the MBA program with undergraduate degrees in non-business disciplines require significantly more pre-requisite coursework than those candidates holding business and business-related undergraduate degrees.

Solving A Problem

Standard business courses often contain content overlap or duplicate content without coordination of topics covered. Functional disciplines become blurred as department chairs and senior faculty structure their course content according to research interests and functional

strengths. Business core course content at the Coles College had become as varied and different as the faculty responsible for its delivery.

The lack of consistency in the introductory core competencies became apparent to downstream teaching faculty and proved detrimental to students as they advanced to their upper level concentration courses. The senior management team saw an opportunity to add value to the program by instituting improvements and consistency in the delivery of core business foundation courses, thereby meeting the expectations of the downstream faculty and improving the overall quality of the MBA product. However, the faculty knew there would be problems involved.

First, faculty members usually do not participate in collaborative teams--discipline content is typically delivered in isolated "silos" of knowledge. Information obtained from the MBA Roundtable Information Clearinghouse (2001) indicated that of the over 3,000 core courses in the database, only 13% were being delivered using teaching teams, as opposed to individual faculty.

In addition, traditional academic departmental structure is not conducive to change as it relates to review, update and introduction of courses. Aversion to the incorporation of technology and thinking in terms of courses rather than innovative packaging of learning modules creates rigidity throughout business colleges.

Despite these historical trends, the teaching team identified a clustering of required topical areas and reasoned that they could be most adequately and efficiently incorporated into two integrated learning modules. A course content task force performed a detailed course process analysis identifying non-value adding wasteful course overlap. The teaching team incorporated the identified in-efficiencies into the course development process. The process yielded two 6 credit hour integrated

pre-requisite courses (Analytical Business Applications and Exploring Contemporary Business) which effectively replaced the eight to ten foundation courses previously required for entrance into the part-time MBA program.

Experience and lessons learned from the successful team taught Executive MBA programs at Kennesaw State University enabled the teaching team to create a unique teaching model to accelerate content requirement coverage and improve delivery efficiencies. Components of the successful teaching and delivery model included interdisciplinary modules, weekend meeting times, appropriate use of virtual class time, extensive use of a teaching technology platform, and an integrated learning matrix.

These two new courses created an opportunity for students to accelerate the completion of pre-requisites. The two courses could be taken concurrently, which reduced the time required to satisfy entrance requirements to as little as four months--down from the 12 to 24 months previously required.

Course Design and Outcomes

The two six credit hour foundation business courses were designed to be accessible and practical for the adult learner. They were scheduled to afford individuals the opportunity to register for both classes by meeting Saturday mornings and/or Sunday afternoons.

An objective of the teaching team was to design interdisciplinary modules in such a way that 30% would be conducted as virtual classes. A virtual class does not meet physically, but uses technology to support the learning objectives. Modules were also organized to exploit foundation business knowledge overlap and focus on interrelated applications. The technology-based learning

matrix became the methodology for design and delivery of these courses.

The effective use of technology became an integral component of the learning matrix. Successful deployment of the integrated learning matrix depended on the identification and incorporation of an Internet-based learning platform. WebCT, an internet-based e-learning framework, was evaluated and determined to provide the necessary flexibility to support the courses. Extensive support for WebCT by the university was an important part of this choice

The matrix encompassed the belief that structured learning communities where knowledge and experience is shared and extensive dialogue and reflection occurs enhances the adult learning experience. As functional topics were introduced, student-learning communities became intertwined through the use of WebCT with the faculty learning community across disciplines. Strategic faculty responses to student questions posted in WebCT discussion forums raised the overall quality and performance level of the integrated learning communities.

The matrix provided a structure whereby student requests for information were initially offered to the entire learning community for feedback. Faculty responses were strategically inserted to allow for student development of ideas and solutions. Employing the Socratic method, faculty allowed the adult learners to rely on their own collective professional experience to self-solve issues and project related questions.

Teaching team members monitored all virtual communication within the learning matrix. Each individual faculty was aware of the objective, process, and expected outcome for each topic module and participated extensively in the cross-disciplinary process. The distance-learning component of the matrix integrated faculty and students

into a learning community and removed the effects of isolation, commonly associated with distance learning.

Operating/Partnering agreements were created at semester onset to delineate expectations of students. The agreements fostered an initial sense of community and were shared publicly via WebCT for peer and faculty review. Students and faculty also dialoged about mutual expectations. This discussion resulted in the development of mutual understanding between the students and teaching team. This encouraged continuous feedback from students throughout the learning experience and allowed for immediate changes to the learning environment when appropriate.

Students revised initial agreements to expand the breadth of topics covered and to improve the quality of their initial deliverable. These changes were passed on to other teams in the learning community. This sharing raised the level of expectations of the student teams and moved the standard for academic rigor of the course upward.

Students became learning cohorts and participated in joint group projects, discussion forums and team-building activities. A supportive learning community ensued, synergistic results occurred and adult learning was enhanced. Assignments were built around a team-assigned corporate entity and foundation business competencies were examined in an interdisciplinary case study that led to an end of term project requiring application of acquired business tools and language foundation.

Other Results of Applying the Solution

Team Teaching. Team teaching requires changes in behavior. A team is a set of interdependent members working for a common goal and is substantially different from a work group. The distinction is that the team requires interdependence while the work group does not.

Frequently, course material is divided between the faculty, and members are only present when they teach the component assigned to them. This is indicative of a work group and is not team teaching.

True team teaching requires interdependence between the faculty members. What one teaches must build upon what the other teaches. Concepts must be purposively integrated. Participation and design are the key elements that build interdependence. This takes commitment and effort. It also requires changes in behavior.

The teaching team made the commitment to teach as a real team and not as a work group. The schedule and learning objectives were developed together. Opportunities for integration were identified and/or designed into the semester's program of instruction. Team members sat in on each other's presentations and participated in discussions. Periodically during the semester, integration was revisited and revised where necessary. The teaching team rose to the challenge and expanded their knowledge on what worked and what didn't work when it came to team teaching.

Multifunctional Approach To Learning. The teaching team designed the content of the courses to avoid the functional silos of the traditional MBA program. The narrow coverage of marketing in marketing classes or finance in finance classes had an obvious downside. Integration of content across functional areas was the goal of the teaching team from day one.

The goal was for students who move through the pre-requisites to enter downstream courses with an appreciation for the inter-relatedness of most business issues. More so, it was the hope that student expectations would create subtle pressures on downstream faculty to provide more cross-functional perspectives in their delivery of core courses.

Challenged Faculty. Once a cross-functional approach to learning was adopted, it required a faculty

member to operate outside of his or her comfort zone. Most graduate faculty are specialists in their respective areas. They are hired for their functional expertise, they teach in their functional areas and they are promoted based upon their scholarship in their specialty area. At one time the "subject area expert" was the undisputed role for senior faculty. That concept is now in question--specially in regard to graduate business education.

Teaching team members of the new pre-requisite courses were required to move out of their specialty area and acquire knowledge in other unrelated areas. In the experience of the current team, this was a worthwhile exercise. There is a sense that the new material will benefit instruction given in other functional areas differently and perhaps even more effectively than in the past. It is still uncertain how this will fit into the reward structure of an academic institution traditionally predisposed to reward only for functional knowledge and competence. There is also some question about the participation of non-tenured faculty in processes similar to the one conducted.

High Mutual Learning Expectations. The learning community approach resulted in a risky shift. Learning expectations moved from a faculty centered and driven position towards student centered and driven. Bulletin board discussions quickly moved from *What do we need to do to meet faculty expectations?* to *What can we do to exceed expectations?* to *Tell us more about how this will help us in the world of business.* High mutual learning expectations were the norm for both classes at the end of the semester. Teaching team members found themselves responding positively to this change, in many instances revising material and upgrading presentation content for continuous improvement.

Classroom Dynamics. Face time in the classroom came to be viewed as a very valuable resource. The teaching team continually worked to make the very best use

of classroom time both in terms of efficiency and effectiveness. Material and activity that did not absolutely need to be in the classroom was moved to the virtual classroom. About 25% of the physical class time was replaced with virtual material for both classes. This was well received by the students who found the freedom to manage their time very beneficial. They also appreciated the respect given for their time that was implicit in this move to virtual class time.

Physical class time was used for specific instruction, discussions and group break out work. The discussions became more challenging and intense as the semester progressed. Wherever possible, the in-class discussions were cross-functional and covered a broad range of topics. It was common for several members of the teaching team to be active in a single discussion. High norms for preparation were common for both students and faculty. The breadth and depth of classroom activities set high standards for incoming graduate students.

Technology. The aggressive use of technology was a key component of the success of the foundation business courses. It would have been difficult, if not impossible, to implement these changes without the ability to leverage the available technology. The course design incorporated e-mail, drop boxes, synchronous and asynchronous chat, discussion bulletin boards, grade books, quizzes, and a multitude of other features.

The teaching team experienced a high degree of satisfaction with the chosen WebCT technology. All course materials were available on-line, and the system was university supported 24 hours per day, 7 days a week.

Increased Enrollment. *And finally--what happened to enrollment?* Following a 60% decline in enrollment from the previous year, the inaugural offering of Analytical Business Applications and Exploring Contemporary Business courses generated enhanced interest in the part-

time MBA program. The percent accepted and enrolled increased by 150% in the fall of 2001. The tandem offering of these two courses comprised 145% of the 150% enrollment increase, thus offering an early indication that the changes achieved one of the objectives of the senior management team.

LESSONS LEARNED

Downstream Faculty Involvement

Downstream faculty must be involved in the design process. Using a systems approach, the customers of the pre-requisite courses are the faculty who teach in the business core. An initial survey concerning what entering graduate students need to know was invaluable. Many faculty expressed appreciation for being asked, and inclusion appears to bias them in favor of the changes.

Administrative Support

Support from senior administrators is critical and hinges on a continuous loop of providing information and soliciting input. Department chairs proved to be especially critical as the team teaching approach moved the organization to a matrix structure. The chairs act as the functional managers and are essential to the long-term success of such a move.

Change Can Happen Quickly

Change can be initiated quickly if championed by influential members of the faculty. However, knowledge of the course approval system and the process to expedite approval is essential and critical. Respected faculty

members who have influence and knowledge of the system can and should be utilized to expedite the change process.

Empirical Data

Change is easier when driven by empirical data. For example, survey information that much of our decline in enrollment could be attributed to our burdensome pre-requisite policy fostered the need for innovation. The proactive use of this information created the rationale for change, and also provided the impetus to act quickly rather than slowly.

Best Technology Available

Course success depended on the availability of the best course technology, which the teaching team defined as available, user friendly and supported 24 hours per day, seven day a week by information technology professionals at the institutional level.

Technology Learning Curve

Time invested in learning the course technology system is extremely important. An unbalanced team puts too much pressure on the members that know how to make the system work. A commitment to learn the system balances the contributions and workload.

Value Driven Change

A teaching team driven by the value--*What's best for the students?* can create significant improvements. When the change is value driven, it means more and often justifies the extra time and effort to make it happen.

Continuous Review

During course delivery, periodic reviews to adjust schedules are essential. The map is not the terrain. The plan was developed and as time passed, the situation changed. Building schedule reviews into the process helps to alleviate the strain on the system.

Evaluation and Commitment

Clear evaluation criteria for student performance, coupled with a commitment to student success and the maintenance of high standards of performance are a winning combination. From course onset, the system needs to include norms for expended effort, hard work and satisfactory performance, along with positive feed back as appropriate and quick feedback for work that is below the accepted standard.

Learning Communities

Effort spent in the first few weeks to create learning communities pays off in the long run. Investing in team building and operating agreements early in the process will pay off extremely well in later weeks of the course.

SUMMARY AND CONCLUSIONS

This paper described the process in which a traditional eight course prerequisite requirement was replaced by two totally integrated courses that leveraged technology in face-to-face and virtual class settings. The course design process involved the creation of a faculty course content task force based on functional competencies.

After initial design by the task force, faculty that demonstrated passion and commitment to explore

innovations in the delivery of higher education were invited to join an integrated teaching team. This team designed an alternative approach to learning core business competencies built on the premise of adult learning and learning communities. The competencies were bundled to satisfy customer needs for an efficient delivery system and incorporated downstream faculty expectations.

MBA associates and faculty formed a learning partnership. Technology provided the foundation for the learning environment and enhanced communication and feedback. High quality outcomes resulted from the student/faculty partnership and mutual learning expectations. Student retention exceeded levels historically attained in all graduate business courses. Students completing these integrated business foundation courses progressed into the Career Growth MBA with higher expectations from their learning environment. This resulted in pressure for continuous improvement, system-wide change and accelerated faculty development.

It was shown that collaborative design of integrated courses can be realized when the right "mix" of faculty is part of the change process. The teaching team concluded that innovative processes need to be included although they may depart from traditional curriculum design and approval.

On-going research will be conducted on new entrants to the Career Growth MBA program. A comparison will be made between students who completed the business foundation course(s) and those are entering the core MBA program with business undergraduate degrees. It is hypothesized that students completing these integrative courses will graduate with statistically higher GPA's and greater levels of satisfaction with their learning experiences.

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INTERDISICPLINARY PROBLEM-BASED LEARNING: LINKING ENVIRONMENTAL POLICY AND ENVIRONMENTAL SCIENCE

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INTRODUCTION

The use of problem-based courses in environmental chemistry has been discussed in the Journal of Chemical Education (Lantz, Feindt, Lewellyn, & Walczak, 1999; O'Hara, Sanborn, & Howard, 1999). Juhl, Yearsley, & Silva (1997) discussed an interdisciplinary project that did not involve linking two courses. An expanded discussion of the courses described in this article, focusing on the teaching of analytical chemistry concepts, has recently been published (Cancilla, 2001).

PURPOSE

Policy majors interested in environmental issues frequently hear that science is important. For most policy students, however, science--especially chemistry--is terra incognita, evoking nothing but the fear and loathing engendered by their Chemistry 101 class. Similarly, "hard science" devotees may hear that policy is important to science, but they tend to view policy as fluff, not worthy of the attention of those dedicated to quantification and

reproducibility. This is true even in programs that pride themselves on their interdisciplinary nature, such as the majors in Environmental Policy and Environmental Science at Western Washington University.

This paper describes an effort to bridge this divide through the development of a problem-based environmental analytical chemistry laboratory and its integration with an undergraduate environmental law course. The primary goals of the chemistry course include:

To provide students experience with a variety of commonly used analytical methods ranging from screening to quantitative analytical methodologies

To provide students with experience in developing and interpreting quality control elements to support analytical results

To link toxicological and chemical methodologies to address broad environmental problems

To demonstrate the relationship between analytical variability, scientific uncertainty and legal uncertainty

To provide students with experience in communicating scientific data in policy and legal contexts

The primary goals of the environmental law course include:

Through integration with the Environmental Chemistry class, to allow students to engage in teamwork to address environmental problems involving the interface between science and law

To provide students with experience in communicating political and legal principles to science majors

To provide students with a substantive background in legal issues relating to hazardous and toxic waste disposal and water quality regulation

To show the difficulties involved in defining and applying "the law," and to examine the role of lawyers in implementing the law

To introduce students to legal terminology, case analysis, and the use of statutory materials

STRCUCTURE OF THE COURSES AND THE PROBLEM

Upper division undergraduate courses in environmental law and environmental chemistry are offered once a year by Huxley College of the Environment at Western Washington University. Environmental Chemistry is part of a program in environmental toxicology and chemistry within the Department of Environmental Sciences. The Environmental Law course is offered as part of the program in environmental policy and planning within the Department of Environmental Policy within Huxley College.

In the Environmental Chemistry course, the entire ten week laboratory is dedicated to resolving legal and scientific questions related to the question of *What's Flowin' Through Rowan?* In the Environmental Law course, students learn about the legal and policy issues that will provide the necessary background for the "Rowan" problem. Students in both classes are asked to investigate chemical and legal issues related to the possible presence of

environmental contaminants under the Clean Water Act and/or the Safe Drinking Water Act.

The scenario generally provides that the hypothetical city of Rowan is facing an administrative hearing by the Environmental Protection Agency for continued violations of the Safe Drinking Water Act. In particular, the city has been cited for violations related to the presence of atrazine in its finished drinking water.

In this exercise, the law students are divided into groups representing either the City of Rowan, the U.S. Environmental Protection Agency, the State Department of Health, or a citizens' group. Depending on class size, additional groups, such as the State Department of Ecology, can be added to the hearings or, alternatively, there can be two sets of groups, with hearings scheduled on separate days.

A chemistry student acts as a consultant to each party and performs a series of chemical and toxicological tests designed to assess the quality of Rowan's drinking water. Typically, approximately twelve students take the environmental chemistry course. This means that each chemistry student is paired with between two to five students from the environmental law class to form a group.

At the beginning of the course, both the law students and environmental chemistry students are provided with an information packet containing historical chemical and toxicological monitoring data covering the previous two-year period. The package contains information relating to the positions of the U.S. Environmental Protection Agency, City, citizens' group and the Department of Health, providing each group's perspective of the alleged problem. It also contains maps showing land use patterns within the Rowan watershed.

For the chemists, the introductory information includes readings and material on quality control and

quality assurance practices. The lawyers also receive rules of administrative procedure.

One of the complicating factors presented to the students in the information packet is the fact that two separate laboratories were involved in the assessment of Rowan's watershed during the previous two years. Data from these two laboratories during the two-year period showed atrazine levels ranging from levels that would constitute a violation to levels that would not violate drinking water requirements.

The information packet notes that the City claims that analytical variability makes the data unreliable for use in determining whether there has, in fact, been a violation of the law. As a result, the City claims that it should not be fined for non-compliance under the Safe Drinking Water Act. Other groups claim the data do, in fact, provide evidence of violations and that the city should indeed take corrective actions and/or face fines.

During the course, students are provided additional information in the form of memos, correspondence, and newspapers. For example, each student receives a copy of the "Rowan Roundup," Rowan's newspaper, which contains a number of articles relevant to the issue of resolving the problem of *What's Flowin' Through Rowan?* In particular, the articles contain hints suggesting that Rowan is facing a far larger environmental problem than atrazine contamination.

Articles may describe other potential sources of water pollution or hint at other types of pollution that may be found in Rowan's waters. As students work through the scientific evidence, they must also pay attention to the land use and political context in which they work.

The chemistry students, using the historical information as a starting point, must conduct a series of chemical and toxicological studies on the waters collected in and around the city of Rowan. Their ultimate goal is to

determine whether the city is out of compliance with the Safe Drinking Water Act .

The chemistry students report their data to the law students, who must in turn explain how and why the data will be used and what criticisms of the data may arise. The law students must frame their arguments within the governing law (substantive and procedural) and may obtain other groups' data to review.

The development of the course around the theme of *What's Flowin' Through Rowan?* allows for course materials to be modified so that additional environmental issues can be highlighted. For example, issues related to the Clean Water Act, Total Maximum Daily Loads and permitting under the National Pollutant Discharge Elimination System have been addressed by changing the scenario. In the event that class size precludes the use of a final hearing format, negotiation exercises have also been developed.

ASSESSMENT AND STUDENT REACTION TO THE COURSES

The final examination is a mock agency hearing in which each group has an opportunity to argue its case in front of a hearing board. The board is made up of faculty members and outside representatives (including local, state, or federal agency representatives) that have experience with compliance issues. Students must follow specified federal administrative procedure requirements (although lapses are always tolerated) in presenting facts, evidence, and arguments during the hearing.

Students are also assessed on their final reports. Chemistry students must prepare a final consulting report, while the law students must prepare a final "brief" that describes the facts from the perspective of the party and supports each legal argument. Students use their reports

during their group meetings, as well as during the final hearings.

Many students have used their final reports when applying for jobs as examples of their writing and critical thinking skills. Student reviews of the course have provided positive feedback to this approach. A number of students have contacted the authors after graduating to comment on how well this class has prepared them for their current positions in the environmental field. Although the initial preparation of problem materials is time-consuming, this approach has proven to be flexible and effective.

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TEACHING AND RESEARCHING

HIGHER-ORDER THINKING

IN A VIRTUAL ENVIRONMENT

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INTRODUCTION

The Keller (1968) personalized system of instruction (PSI) is a method of self-paced learning in which students proceed through course material at their own pace by writing unit assignments on study questions or problems given to the students beforehand. Other students act as reviewers or tutors by giving feedback on the unit assignments.

Keller's (1968) personalized system of instruction is a mastery system since students demonstrate mastery on a given unit before they can proceed to the next unit. Research has shown that mastery learning in general and the Keller system in particular produce superior learning (Kulik., Kulik, & Bangert-Drowns, 1990).

Bloom's (1956) taxonomy in the cognitive domain is a system for categorizing the thinking levels required by specific questions, problems, or exercises. Bloom identified six hierarchical categories of thinking: 1) knowledge; 2) comprehension; 3) application; 4) analysis; 5) synthesis; and 6) evaluation. Although Bloom's taxonomy is not the only possible way to classify thinking levels, it is widely known and used in education, and therefore provides a

good starting point for teaching higher-order thinking and studying its development.

This paper describes a method for studying the teaching and learning process, called computer-aided personalized system of instruction (Pear & Crone-Todd, 1999), that combines Keller's personalized system of instruction and Bloom's taxonomy. Combining the Keller system with Bloom's taxonomy required a technological solution. By automating repetitive tasks, computer technology increases the efficiency of the process. Perhaps even more importantly, computer technology makes it possible to study the process in a comprehensive and systematic manner.

THE METHOD

As originally developed by Keller, the personalized system of instruction uses students in more advanced courses as peer reviewers. With computer technology, however, a more advanced course is unnecessary. Each student's position in the course is available instantaneously. This enables the computer-aided personalized system of instruction program to use students in the same course as peer reviewers. An added benefit of using computer technology is that students do not have to be at one specific location at one specific time. The computer-aided personalized system of instruction courses at the University of Manitoba are conducted through the Internet.

Assessment

In courses at the University of Manitoba, the program requires that a unit assignment be marked by the instructor or teaching assistant or by two peer reviewers. When two peer reviewers mark a student's assignment,

both must independently agree that the assignment is a pass in order for the program to record it as a pass. In addition, all assignments are automatically recorded to disc for the instructor to sample and evaluate. There is also a built-in appeal process for arguing the validity of a given answer.

The method is applicable to any course topic and any set of questions or problems. The instructor inputs questions or problems and certain parameters, such as the number of units in the course, the course credit for each unit assignment, the course credit for peer reviewing, and whether there are to be examinations or projects in the course and their respective course credits. The program then automates all the administrative functions of the course.

Thus, the study material (e.g., text, videos, lectures) along with the questions, exercises, or problems selected or generated by the instructor form the basis or core of the system. The type of learning that students can acquire from the course will be highly dependent on this core.

If the instructor writes questions that require only rote learning (level 1, or "knowledge," in Bloom's taxonomy), for example, students will be unlikely to advance above the rote level. For this reason the computer-aided personalized system of instruction is designed for constructed or composed solutions or answers rather than option-based (e.g., true-false, multiple choice) responses. However, a method for ensuring that students would learn and interact with the material at the highest possible level of thinking was still needed. Hence, a modified form of Bloom's taxonomy was integrated into the system.

There were several reasons for modifying the taxonomy. One is that there are reliability problems with the taxonomy (Kotte & Schuster, 1990). Another is the complexity of the taxonomy, which makes it difficult to apply. It is anticipated that further refinement and

elaboration of this modified taxonomy will result from research on its use within the computer-aided personalized system of instruction program.

Taxonomy

The taxonomy as currently used with the computer-aided personalized system of instruction is as follows:

Rote knowledge. The answer is word-for-word or closely paraphrased from the study material.

Comprehension. The answer is in the student's own words.

Application. A concept is applied to a new problem or situation. Examples would be illustrating a concept with a new example (e.g., one not in the study material) and applying an equation to a new problem.

Analysis. Breaking down a concept into its parts. This occurs when, for example, one compares and contrasts two or more concepts.

Synthesis. Integrating two or more concepts to form something new. An example would be combining several styles of painting to produce a new style.

Evaluation. Providing reasoned argument for or against a given position. An example would be an argument considering the pros and cons of cloning research from an ethical perspective or from a scientific perspective.

Operational definitions permitted the thinking levels of questions and answers to be assessed with good reliability (Crone-Todd, Pear, & Read, 2000; Pear, Crone-Todd, Wirth, & Simister, in press). This has set the stage for research on ways to raise the level of thinking at which students respond to questions in the computer-aided personalized system of instruction courses.

RESEARCH ISSUES

The first foray into investigating increasing thinking levels in student answers consisted in providing students with the modified taxonomy, the thinking level required by each question, and a system of bonus points for each question answered above the level outlined (Crone-Todd, 2001). Thus, if a question asked for an example of a concept without specifying that the example had to be original (i.e., not in the study material), this question would be considered to be at level 2. If a student gave an original example this would be answering at level 3, and the student therefore would be answering above the level of the question. This procedure successfully increased the levels at which students answered the questions, showing that students are able to increase their demonstrated thinking levels.

Using the computer-aided personalized system of instruction as an instrument for probing students' thinking levels in a course, faculty are in a position to study variables thought to be important in helping students advance their thinking levels. For example, the computer-aided personalized system of instruction might be used to examine whether some study materials and media more effectively promote higher-order thinking.

Possible research issues include the following:

Are textbooks that lead the reader through the discovery process more effective in facilitating higher-order thinking than those that present a comprehensive coverage of factual material?

Are lectures or discussion groups more effective at promoting higher-order thinking? Are face-to-face discussions more effective than on-line discussions?

Another important research area concerns the questions, exercises, and problems in a course. Research questions that might be studied here include:

> *What is the most effective proportion of each category of thinking level? For example, too large a proportion of evaluation questions (level 6) might be detrimental.*

> *What is the most effective way of sequencing the question levels for a given unit in the study guide?*

The information obtained by research on these issues would likely be applicable to courses taught with various other methods, not just those taught using the computer-aided personalized system of instruction.

The social milieu also provides a rich source of variables, in that it includes students acting as learners and peer reviewers as well as the instructor who oversees the process. Overall, students perform their peer-reviewing duties effectively (Martin, Pear, & Martin, in press a) and respond to the feedback (Martin, Pear, & Martin, in press b).

Students in a computer-aided personalized system of instruction-taught course receive much more substantive feedback on their work than would be possible in a course taught by traditional methods. This interactive nature of the computer-aided personalized system of instruction fits a social constructivist model of knowledge generation through interaction with others (Pear & Crone-Todd, in press). The peer reviewers find (often to their surprise) that reading other students' answers or solutions and commenting on them initiates their own learning and higher-order thinking. Another important area of study,

therefore, is the effects of the peer review component on higher-order thinking.

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IMPLEMENTING PEER ASSESSMENT TO ENHANCE TEACHING AND LEARNING

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INTRODUCTION

Assessment of students by their peers can bring some benefits to the students involved. Through their assessment of others' work, students can be exposed to a range of answers to problems (Gibbs, Habeshaw & Habeshaw, 1986) and can become more critical in the way they appraise others (Jacques, 1984). Involvement of students in the assessment procedure helps shift their role from passive recipients to more self-directed learners (Knowles, 1990). It may also foster their active engagement in their task and allow them to exercise responsibilities for their learning, thus leading them to become autonomous learners. This is, of course, one of the central goals of higher education (Boud, 1995).

Unlike the traditional forms of assessment in which the product of student assignment is assessed by the lecturer, in peer assessment students play a part in both the process and the product of their learning. This involvement can develop their sense of ownership and control of their own work. Development of such an ownership is significant in view of recent findings suggesting that students tend to become more actively involved in their learning when they believe that success or failure depends on their own efforts and not on factors outside their control (Brown, Bull & Pendlebury, 1997; Entwistle, 1996).

The use of peer assessment in higher education has been advocated by many educators (Ashcroft & Palacio, 1996; Boud, 1991; Boud & Holmes, 1995; Brown & Knight, 1994; Brown, Bull & Pendlebury, 1997; Falchikov, 1986; Gibbs & Jenkins 1992; Knight, 1995; Moore, 1994; Stefani, 1994) and faculty have been seeking ways to use it in their courses. The method has been tried in the undergraduate level across different disciplines such as Medicine (Burnett & Cavaye, 1980), Biological Sciences and Biology (Falchikov, 1986; Orsmond, Merry & Reiling, 1996; Stefani, 1994), Engineering (Boud & Holmes, 1995; Oldsfield & MacAlpine, 1995; Rafiq & Fullerton, 1996), Optometry (Conway, Kember, Sivan & Wu, 1993), Management (Kwan & Leung, 1996; Sivan, Yan & Kember, 1995), Leisure Studies (Wicks & Stribling, 1991) and Languages (Cheng & Warren, 1997). It has been used with different types of assignments such as practical training (Burnett & Cavaye, 1980), essay (Falchikov, 1986), laboratory report (Stefani, 1994), poster (Orsmond, Merry & Reiling, 1996), verbal presentation (Oldsfield & MacAlpine, 1995) and examination papers (Boud & Holmes, 1995).

To date, the use of this method has been confined to a single class or course and student reactions solicited mainly through a structured questionnaire. The purpose of the present study is to examine the process through which peer assessment is implemented in order to identify those aspects which lead to successful outcomes.

In order to achieve the above aim, the author has used peer assessment in several classes involving an action research approach. The use of such an approach includes a cyclical process of planning, action, observation and reflection with the aim of improving the educational process by learning from the previous cycle (Kember & Kelly, 1994; Zuber-Skerritt, 1992). To better reflect on the

use of peer assessment, student feedback was solicited through both questionnaires and semi-structured interviews.

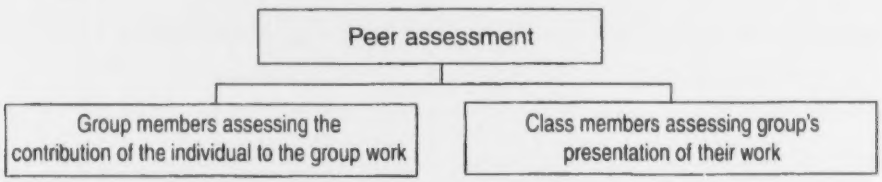
DESCRIPTION OF THE STUDY

The present study on the use of peer assessment consisted of two cycles of action research. In the specific context in which the method was introduced, all participating students were teachers studying in the Postgraduate Diploma in Education program offered by the Department of Education Studies at the Hong Kong Baptist University. The use of peer assessment aimed at encouraging students' active participation in the learning process as well as facilitating their reflective aspect of assessment.

Peer assessment was introduced in two courses. The first cycle of action research was undertaken during the first semester in the course "Curriculum Studies" which is a common core subject. The second cycle was held during the second semester in the elective course "Effective Communication" which was attended by most of the students who participated in the first cycle.

The assessment of these courses comprised two components: coursework (60%); and term paper (40%). Peer assessment was introduced in the coursework which involved a group project. Two types of peer assessment were tried. Figure 1 shows a flow chart of the two types of assessment.

Figure 1. Types of peer assessment


Peer assessment
Group members assessing the contribution of the individual to the group work
Class members assessing group's presentation of their work

Implementing Peer Assessment

Students were required to write a project in groups of three to five and present it to the class. In the first form of assessment, students assessed the overall performance of each group in the presentation. In the second form of assessment, students within each group assessed the contribution of their fellow students to both the written work and the oral presentation. Based on the contribution ratings, the mark of each individual student was then calculated using a method which was developed by Goldfinch and Raeside (1990) and later simplified and improved by Conway, Kember, Sivan and Wu (1993). Both types of assessment were based on a set of criteria using a five point Likert scale ranging from "outstanding" to "poor".

In both cycles, forms for assessing individual contribution to group work were distributed to students with the request to return them together with their written projects. To maintain confidentiality, students were given the option to submit the completed form directly to the lecturer. The assessment of each group's presentation took place immediately after the presentation.

Cycle 1. In the first cycle, students were asked to assess their group mates and classmates based on criteria set by the lecturer. Each student was given two separate forms. The criteria for assessing the groups' presentations referred to the content and the context of the presentation. The criteria were established based on the themes on which students were asked to write their project. In this specific case, the themes related to reflection on an existing syllabus familiar to the students.

Students were asked to evaluate the syllabus in terms of its aims and objectives and factors affecting its development. A total of five criteria were used related to the content of the presentation plus three criteria related to

the context of the presentation. Concerning the context of the presentation, students were asked to assess the presentation in terms of its clarity, how it held their interest and the extent to which they understood the material.

The criteria set for the assessment within each group referred to the level of participation of each individual on six different tasks. The tasks included the summary of each individual's work, organization and combination of the individuals' work, writing the combined group paper; producing a clear explanation in the written description, organization of the presentation and contribution to the presentation. Students were also given the option to add or substitute tasks if they felt that they were important for their project.

Based on students' feedback on the first implementation, some changes were made to the strategies of implementation for the second time. A major change was the involvement of students in establishing the criteria for assessment of the presentation. While in the first cycle the criteria were set by the lecturer, in the second cycle students could create the criteria by themselves.

Cycle 2. The second cycle was held during the second semester in the elective subject "Effective Communication" which was attended by some students who participated in the first cycle. In this cycle students were briefed on the method and two sessions were dedicated to establishing the criteria. The lecturer shared with the students the experience of peer assessment in the first cycle as well as the suggestions made by the students for improvement. The lecturer further solicited the students' views on establishment of the criteria for assessment of their classmates.

After brainstorming in class, students arrived at an agreeable set of criteria for assessing the groups' presentations. The criteria set by the students included the organization of the presentation, its relevancy to the theme

under investigation and to the teacher's role, its clarity, and its interactivity and ability to hold interest. Students also added the criteria of time-keeping. Concerning group size, students had free choice of grouping with no limit on group size. As a result, there was one group which consisted of six members.

Measurements

Student reactions to peer assessment were solicited by means of questionnaires and semi-structured interviews which were administered and conducted before the students knew the assessment results of the subject. The questionnaire consisted of statements to which students were asked to respond by indicating their level of agreement on a five-point Likert scale. Two statements referred to the clarity of the explanation of the assessment types and the other statements referred to the appropriateness of the method, its fairness and the role students should play in assessment.

Students were also asked whether they had previously participated in peer assessment. Finally, there was an open-ended question about peer assessment in general. Data were analyzed using "SPSS for WINDOWS" except for the open-ended question responses which were processed together with the material obtained from follow-up interviews. The overall return was 39 out of 50 (78%) in the first cycle and 28 out of 29 (96.6%) in the second cycle.

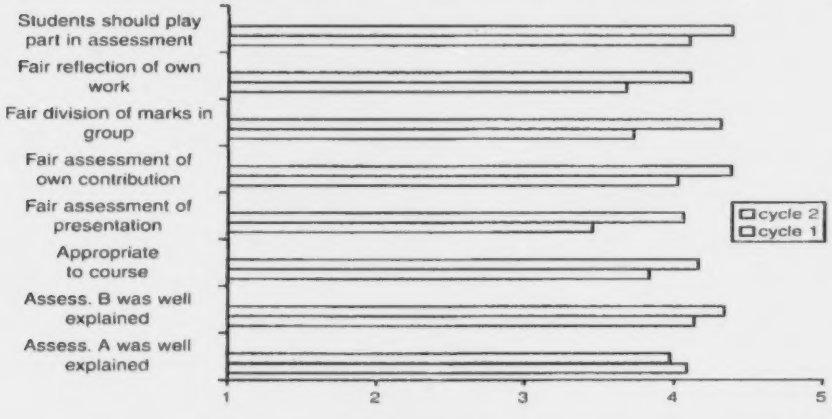
Nineteen interviews were held with individuals selected at random and they were conducted by a trained interviewer. Students were asked to comment on the adequacy and appropriateness of the two types of peer assessment and the implementation of the method. They were prompted to suggest improvements. Students were also asked to elaborate on their ability to assess fairly and on being assessed by their classmates. The interviews were

recorded, transcribed and then analyzed using the NUD◦IST qualitative analysis (Richards & Richards, 1991).

FINDINGS

Figure 2 shows the mean score of student responses to the questionnaire. 'Assess. A' refers to the assessment of the contribution of each individual to the group project and 'Assess. B' refers to the assessment of the group presentation

Figure 2. Student Feedback on Peer Assessment



It can be seen that overall, students accepted the method and thought that they should play a part in the assessment. They also regarded the method as fair, especially the assessment of the individual contribution to group work.

The figure also indicates differences between the scores of almost all items between the first and second cycle. These differences were found to be significant ($p<.001$) in items related to the fairness of assessing the group presentation as well as to the fairness of the division of marks among group members. The differences were also found to be significant ($p<.05$) in items related to the appropriateness of the method to the course, its being a fair assessment of the individual contribution to the group

project and its being a fair reflection of each student's work.

Responses to the question concerning students' previous participation in peer assessment indicated an increase in their participation rate in the second cycle. Of those who participated in the first cycle, 71.8% had previous experience compared with 89.3% in the second cycle.

Follow-up Interviews

The follow up interviews held with the students provided a comprehensive picture about their views of the method and its implementation. The majority of the students agreed in principle with the use of peer assessment and supported its implementation. They regarded it as a good mechanism to develop critical thinking and to learn from others' work. Comments included:

> *I think that peer assessment is a good way to develop the students' ability of assessing critically. It provides the chance to us to serve as judges and let us learn how to make a decision which things are good or bad.*

> *I think it is a good method because we can judge others' work and make comparison with our own works and learn the good points of others in order to seek improvements*

Students also regarded the method as a way to motivate everyone to take part in the learning process:

> *I think it is a good force to make the individual work harder and contribute to the group work and*

not to do some harm to the whole presentation of the group.

...if all the group members work very well together I think they should get the same mark. But sometimes, we do have some members who do not cooperate, if that happen, they should have different mark.

Students also stated that the method is fair and objective and provides a comprehensive view of the students' work in the subject:

I certainly appreciate peer assessment. I appreciate the concept and the spirit in assessing others. And I think, peer assessment can, in some ways, assess the student's performance more effectively and objectively and not only from the teacher's point of view.

One student elaborated on the advantages of using the two types of assessments

I think it is good. There are two parts. One part you have to assess those who present and the other part you assess your own group members. I think it is quite effective and it also forces you to pay attention and I think I can do a little bit of evaluation when you listen, not just sitting there and day dreaming. For the second part, if maybe some members do not cooperate, then it is a good way for the group to put them down in grading to tell the lecturer that may be some students do not do their work.

Although most of the students generally supported peer assessment, some raised their concern with regard to

their ability to assess their fellow students, pointing out that they were not professional. These comments were made mainly by students who participated in peer assessment for the first time. In addition, those students expressed their concern that the objectivity of their assessment of others may have been affected by personal relationships with their fellow students.

> *In my opinion, sometimes that may be sort of concern if those in my group are my friends. I even know that I may tend to give them higher marks, but for those that I don't know, well, I may be a little bit more objective*

Students indicated that there were some practical problems in the application of the method. These included the insufficient time allocated to group presentation and the size of the group which was regarded as too small.

> *In general, I think that the method of peer assessment is quite fair, but its function is quite limited for a small group size. It is much better if the group size is bigger. For example if the group has about six to even eight members therefore each member of the group will have a more objective opinion to the other group members, because the sample size is greater.*

Several suggestions were made concerning the ranking procedure and the use of certain criteria

> *Maybe to give a mark total rather than every criterion, because everyone's strength is different*

I think that the criteria could be developed with the students, although it will depend on the maturity of the students

Comments made by students who participated in both cycles highlighted the positive implications of involving them in setting the criteria for assessment. They indicated that their participation in the process contributed to their acceptance of the criteria by developing their sense of ownership

Last time most of the criteria were set by the lecturer and this time, the lecturer invited us to set the criteria by ourselves. This is the major difference, because we can voice out our opinions, so in a sense, it is good for us.

Because if the lecturer himself set the criteria, maybe there are some occasions that one or two members do not agree with that. If we all agree with some criteria, we all accept it, then it is OK, it makes the assessment more convincing.

Involvement in the criteria setting also contributed to their understanding of the criteria and thus facilitated their learning

I think I am more familiar with the criteria and what's going on...when we prepared our presentation, we knew exactly what our presentation should be, and it helps us to make our work easier.

One student suggested to have an additional input from the lecturer to the criteria of assessment:

It is pretty good that the lecturer can add one or two criteria so that we can follow and think what the lecturer requires us to do or to pay important attention to, if the lecturer does not talk about that, then we just set the criteria for ourselves, then maybe the lecturer will somewhat disagree with what we want

Reactions of students who participated in the two cycles of action learning suggested that their previous experience in the same types of peer assessment during the first cycle increased their confidence in the method.

When I did it first time, I needed longer time to think what grade I should give to this group. Besides, I worried a lot whether I gave a fair mark to others. However, I can do it quite fast this time...More you do, better you can do it.

CONCLUSIONS AND RECOMMENDATIONS

The present study on the use of peer assessment showed that overall it was successful. In both cycles of action research, students were found to be in favor of the method. Students' accounts indicated that the two types of assessment contributed to their learning by developing their critical thinking in the process of assessing others' work and reflecting on their own. Results of the study also denote the significant role that students' ownership of assessment criteria plays in facilitating their learning.

The strategy of involving students in the development of the criteria for assessment can be an effective channel to develop their self-direction and thus to improve both learning and teaching. In addition, previous experience of students in using the method seemed to contribute to their confidence in using it. The support given

by the students who participated in the two cycles, to the changes made to the strategies of implementation, especially to the establishment of the criteria, may well have contributed to the effectiveness of the method.

Based on the present study and in order to utilize the potential of peer assessment to enhance teaching and learning, it is recommended that faculty build on students' experience when introducing it. Using students' suggestions for improvement so as to involve them in criteria setting proved to be a good way to empower them, to facilitate their learning and to contribute to favorable attitudes towards its use.

Another recommendation that can be drawn from this study is that it is beneficial to introduce this method in a gradual way into the course of study so as to develop students' confidence in using it. Lastly, students' positive reactions to the two different types of peer assessment suggest the importance of using both types when utilizing group projects. The two types of peer assessment complement each other in that the assessment of the individual's contribution to a group project focuses on the process while the assessment of the group's presentation focuses on the product. Thus, they can provide a broad account of students' learning.

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RECRUITMENT, SELECTION, TRAINING AND EVALUATION OF MENTORS FOR ONLINE LEARNING

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INTRODUCTION

In the burgeoning field of online course offerings in higher education, some long-standing principles still apply. Among these is the centrality of the instructor-student interaction, as eloquently put by Columbia's Paul Goodman (1962), who wrote in his description of the characteristics of a community of scholars "Teaching and learning are a personal relation; it is necessary for both the teacher and the student" (p. 14).

Three decades later, in his description of learning organizations, Peter Senge (1994) wrote, "Though it involves individual skills and areas of understanding, team learning is a collective discipline" (p. 237), reaffirming the same concept. While such a collaborative educational experience seems simple to envision in the traditional classroom setting, how can it be effectively transferred to the online environment?

Numerous studies have indicated the need to create such connections in distance education. A study of distance learning via educational television (Dillon et al., 1992) compared the attitudes of on-campus and distance students and found that the faculty offering courses in distance formats should be trained "to assume a more active role in

communicating with the distance learner" (p. 43). Gunawardena and Zittle (1997) examined the importance of social presence in the computer-mediated environment. They found that social presence, or "teacher immediacy," was a strong predictor of participant satisfaction in the virtual environment, just as it was in face-to-face instruction.

A study by Brown (1996) tied teacher-learner interaction directly to distance student drop-out rates, finding that 67.7 percent of the students who dropped out cited "difficulty in contacting their tutors and insufficient support from them were major contributing factors in their decision" (p. 44). The online environment was found to be intrinsically isolating, according to a study at Carnegie-Mellon University (Kraut, 1998). Overall, robust communication between instructional personnel and online students appears to hold potential to help maintain these critical interrelationships.

Online Programs at Florida State University

Florida State University implemented five fully online undergraduate and six graduate degree programs (Table 1), beginning in fall semester 1999 (LeMon, 2001).

Table 1. Online Degree Programs Offered by Florida State University, 1999-2000

Undergraduate Degrees	Graduate Degrees
B.S. in Computer Sciences	M.S. in Information Studies
B.S. in Software Engineering	M.S. in Criminology and Criminal Justice
B.S. in Information Studies	M.S. in Mechanical Engineering
B.S. in Interdisciplinary Social Science	M.S. in Science Education
B.S.N. in Nursing	M.S. in Educational Leadership and Administration
	M.S. in Open and Distance Learning

The bachelor's degree programs consisted of the upper division coursework following an Associate of Arts degree completed at a Florida community college or elsewhere (Florida State University, 2001b). This "2+2" articulation system is enacted and protected by state statute and exactly parallels the transfer process for on-campus students.

The need to provide high levels of personally interactive student support was perceived as critical to program success (Florida State University, 2001f). The university model is a student-centered system with mentors, or online learning coaches, employed to assist the lead instructor and to support and guide the student through the duration of the online course offering (Florida State University, 2001c).

The student-centered model with instructional facilitation is well established, notably at the Harvard Business School (Barnes et al., 1994). The Open University of the United Kingdom has a similar model in place through its use of faculty tutors for distributed studies (Sidwell, 1994). Alfred North Whitehead (1947) described the ideal relationship in this way: "What the faculty have to cultivate is activity in the presence of knowledge. What the students have to learn is activity in the presence of knowledge" (p. 219). Whitehead presaged the current active learning movement by half a century and the importance of guiding students in the exercise of their own educational responsibilities is still emphasized.

As Silberman (1998) wrote, "participants *acquire* knowledge and skill rather than merely *receive* them" (p. 1) making active learning superior in many ways to sustained lecturing. Such a system requires transformational thinking about the relationship with the learner, as described by Dolence and Norris (1995). "Learning mentors will help students deal not with basic information on a subject, but on sorting out relationships and higher order concepts.

Preparation for mentoring sessions will include substantial knowledge navigation by the learner" (p. 63).

THE MENTOR PERSONNEL MANAGEMENT SYSTEM AT FLORIDA STATE

The mentor position, as configured at Florida State University (2001c), was created for specific student and faculty support roles in online courses. These include completing course materials, initiating and maintaining contact with students, responding in a timely manner, facilitating electronic learning and discussion groups, attending to student progress, grading assignments, reporting grades, and communicating with faculty.

Since some mentors could be eligible for visiting appointments in the academic department offering the course, they were required to meet regional accreditation standards in the field, notably master's degrees in the field (Commission on Colleges, 2000). Mentors with less than graduate preparation (but at least a bachelor's degree and significant professional experience) received non-academic appointments. The university consistently sought persons with strong interpersonal and communication skills, demonstrated experience and affinity for college students, and good organizational and record-keeping abilities.

Recruitment of Mentors

Mentors for the online programs were found through four avenues--the Florida community college system, the university's own graduate programs, public advertisement and recruiting activities and referrals from active mentors after the program was underway.

Mentors coming from the public community colleges in Florida satisfied several of the University's requirements. If they were in faculty positions, they already

met the graduate preparation requirements of their disciplines. If in administrative or staff roles, they had documented experience in working with students at the post-secondary level. Additionally, since community colleges hire faculty based on teaching ability rather than research (Evelyn, 2001), the skill set they brought to the mentoring role was well suited to the position.

When graduate students within the university have been selected as mentors, many of them have already taken the course with which they would be working, giving them the advantage of familiarity with the course material and, often, the instructor. Some graduate students have worked on an assistantship with a professor on developed an online course in a semester prior to serving as a mentor with that course.

Recruiting external to the university or community college system has taken the form of Website announcements (Florida State University, 2001d) and announcements through professional associations. Some of the external applicants merely discovered the program through Web surfing and offered their services. The value in having these persons in the mentor cadre exemplified another of Goodman's (1962) principles. "They have the mastery that comes from actual practice, but teach with the ideality of the future" (p. 17). The mentors from the community at large stood to benefit, as well, as "working with students changes the way adults think about themselves and their careers" (Riel, 1996, p. 193).

Mentors who have served for one semester or more have also referred colleagues and acquaintances to the program. These persons have come from any of the three categories previously mentioned: community colleges, graduate programs, or private practice.

Selection of Mentors

The selection process for online mentors at Florida State was built as a two-step process (2001a). Mentor-candidates are initially screened at the Office for Distributed and Distance Learning. This office serves as a support unit for the entire "electronic campus" initiative at the university, of which distance learning degree programs are a part. This review consists of assessing and verifying credentials, reviewing prior work experience, personal or telephone interviews, and collecting any supporting documents. From this review, a summary matrix is developed of candidates by discipline and distributed to faculty offering online courses in those areas, along with copies of vita and supporting materials.

Each academic department has the freedom to conduct its review according to its own procedures, as a group or as individual members. The endorsement of at least one faculty member, however, is required for a mentor-candidate to be eligible for an invitation to the university's annual mentor training workshop, held each spring in preparation for the upcoming academic year.

Corollary to the initial pre-hiring selection process is the selection process for actual assignment as mentors for particular courses. Prior to each semester, the Office for Distributed and Distance Learning staff develops enrollment projections for each online course. Then, working with faculty and staff in each department, actual class caps are set in the university course master system (taking into account potential enrollment from Florida State branch campuses and overseas study centers, as well as distance students at large). The total class cap becomes the base number for calculating the number of mentors that will be needed.

The base ratio of students to mentor is currently 20-25:1 at Florida State (2001c). However, this is often

adjusted in cases where special course circumstances such as number of papers to be graded or complexity of course material lead faculty to request a lower ratio. The base ratio is referred to as a "mentor-section".

Experienced mentors are sometimes scheduled for more than one section of a course or a section in more than one course, although first-time mentors are typically scheduled for only one section. Both Office for Distributed and Distance Learning and academic department staff closely monitor enrollment patterns up to the first day of class, in case adjustments to the mentor staffing plan are needed.

Training of Mentors

Mentor-candidates receive training in three major areas: 1) on Florida State's general mentoring principles; 2) with the faculty in the discipline where the mentor would work; and 3) on the online course management software. Training is done in a three-day format (Table 2) and the University pays the travel expenses for mentor-candidates to come to the main campus in Tallahassee for the workshop.

Table 2. Mentor Training Workshop Format, 2001

Day One: 1:30 – 5 p.m.	Day Two: 8 a.m. – 5 p.m.	Day Three: 8 a.m. – Noon
– *Overview of Distance Learning at Florida State University* – *Personnel Issues (FSU email accounts, ID cards, payroll, travel)* – *Introduction to the online Course Management System*	– *Mentoring roles and responsibilities* – *Meetings with individual faculty and departments on upcoming courses and content*	– *Lessons learned from previous mentors* – *Computer lab time for skill practice with Course Management System* – *Workshop review and evaluation*

The first day features welcomes, introductions of Office for Distributed and Distance Learning staff and the mentor-candidates, and a presentation on the history and development of distance learning at the university. There is also a period allotted for personnel matters such as collecting and reviewing any employment paperwork, travel expense review, and the issuance of University identification and email accounts. There is also a reception and dinner that evening to provide the mentor-candidates an opportunity for interaction with faculty and staff associated with the distance learning program.

The second day starts with a presentation on university expectations of mentors. This includes standards of performance, details on the job description, and resources provided by the university to assist mentors in the fulfillment of their duties.

Particular emphasis is placed on the humanistic aspects of online mentoring as previously described in the research background. The remainder of the day is spent by the mentor-candidates in programs provided by each of the academic units offering degrees at a distance. Each develops its own program but typical features include a group meeting of faculty and mentor-candidates to discuss the overall degree program and its goals, sequence of courses, and other characteristics.

The group meeting is followed by a series of individual meetings between faculty members who are interested in employing certain mentor-candidates and the candidates themselves. This provides an opportunity to examine individual course materials and begin establishing a working personal relationship.

The third day begins with a presentation by veteran mentors, each taking part of the job description and illustrating it with lessons learned and tips for success. This is followed by additional computer lab time for the new mentors to practice skills needed in the course management

software. The mentor-candidates are also given a manual, produced by Florida State, using the principles appropriate to adult learners (Novak, 1997), which serves as a workbook to guide them through monitored online exercises.

After they return home, the mentor-candidates are tasked to perform a series of exercises on "dummy" course Websites created solely for online practice (Florida State University, 2001e). These exercises become a skills check-off on the tasks mentors perform--uploading online assignments, posting to the course Website's online grade book, creating study groups out of the online roster, posting course announcements to the course home page and posting discussion questions and answers to the course's threaded discussion page. Once all of the exercises have been done and verified as correct by the Office for Distributed and Distance Learning staff, the mentor-candidates are issued certificates for 12 contact hours and the newly certified mentors added to the pool eligible for employment by the university.

No mentor is permitted to work without at least an abbreviated training program. A study by researchers at Colorado State University (Hartman, Ogden & Geroy, 2001) confirmed the importance of this requirement, reaching the conclusion that electronic communication can leave significant gaps in understanding unless persons receive specific training in this area.

All mentors on the active roster have the opportunity to receive additional training information, whether they are employed in a given semester or not. A password-protected mentor resource Website has been created in which mentors have continuous access to online manuals on mentoring, the course management software and other university resources. In addition, the site provides links to useful aids that mentors can use with their students,

such as tip sheets on online searching, time management, study skills and other topics.

Each semester, one or more conference calls are held with Office for Distributed and Distance Learning staff, moderating discussions with mentors on lessons learned, common problems, and policy updates. Summaries of the conference calls are posted to the mentor Website for the benefit of those who cannot participate. Also, informational emails are sent to the mentors on topics of general interest, such as when new resources have been posted to the Website. Additionally, mentors are asked to participate in threaded discussions on the mentor Website which adds greatly to the university's internal research efforts on how the mentoring process is working.

Evaluation of Mentors

To obtain the fullest possible perspective on how the mentor model is working, Florida State has used a variety of methods. At the end of each semester, lead faculty members are given an evaluation questionnaire to be completed on each of the mentors they have supervised. Areas covered by the questionnaire via a five-point Likert scale are based on the mentor job description (Table 3).

Table 3. Topics for Faculty Evaluation of Mentors

Demonstrate competence in the course content areas.
Demonstrate fundamental computer and Internet literacy.
Demonstrate competence in weekly course administration activities.
Provide students timely feedback on their assignments.
Provide students constructive feedback on their performance in this course resulting in performance improvement.
Grade students' work fairly and accurately.
Facilitate and monitor threaded and/or live discussion.
Respond to students' questions promptly (within 24-48 hours).
Work with students to determine learning needs and provide guidance.
Be responsive to student challenges, needs, and satisfaction.
Initiate and maintain contact with each student.
Meet deadlines and keep records on each student and his/her progress.
Maintain communication with the lead faculty.
Contact the lead faculty with issues requiring his/her attention.
Evaluate assignments and report assessment results to the lead faculty on a timely basis.

Open-ended questions ask the faculty members to comment on each mentor's strengths and weaknesses, as well as the quality of mentor support coming from the Office for Distributed and Distance Learning staff. These evaluations form an important part of the process for mentor retention, promotion, or dismissal.

Faculty comments on the evaluations address several ways in which mentors have assisted them in the delivery of online courses. Faculty have written that the mentors help to establish the relationship with the students, create a human link between the university and the students, keep the faculty members informed as to student progress, keep the students informed about mid-course adjustments to the curriculum, and provide general support to the faculty on grading and administrative activities.

Students have several opportunities to provide feedback on the mentor system. All students taking online classes at Florida State are offered the opportunity to do an electronic survey. This standardized tool covers the entire course experience but one section directly reflects on the mentor model. The items available are similar in content to those on the faculty evaluation.

Additionally, random samples of students are selected from online courses to participate in voluntary telephone interviews with the Office for Distributed and Distance Learning. Student comments from the interviews are categorized into common topical areas, and have shown that several topics have been addressed repeatedly. These include the general role of mentors, the active engagement between mentors and students, the encouragement provided by mentors, the clarification of course content and assignments, assistance with the course management software, and individual personality aspects of the mentors themselves.

Comment percentages have shown the communication function to be the most important and effective with 72 percent of those comments characterized as positive, 21 percent as neutral, and only seven percent were negative. It was concluded that "clarification of course materials and processes" and "encouragement" are the two foremost contributions of mentor support in the Florida State model. DeBono (1999) corroborated the

importance of these functions when he wrote "The biggest enemy of thinking is complexity, for that leads to confusion. When thinking is clear and simple, it becomes more enjoyable and more effective" (p. 172). Therefore, it was reasonable to deduce that if university mentors did a good job of clarifying online course content, students would perform well.

In 2001, Florida State introduced another feedback tool for students in online classes. A Web form called the Mentor Performance Report was created to specifically seek feedback on mentor behaviors in the performance areas outlined in the mentor job description. The form was made available throughout the semester so that problems could be reported at any time.

The results from the first administration of the Mentor Performance Report in summer, 2001, are reported below. In addition to open response areas for comments, the students were asked to respond to five questions on the mentor support function of the program, with some items not receiving responses on every survey. The questions were:

1. My mentor contacts me regularly and responds to my questions in a reasonable length of time.

2. My mentor is helpful when I have trouble understanding course materials or assignments.

3. I would be comfortable having the same mentor in a future course from FSU.

4. I would recommend my mentor to other students who are taking courses from FSU.

5. Communications from my mentor and lead instructor were consistent and did not confuse me.

Responses by the students (Table 4) were very positive.

Table 4. Mentor Performance Report, Summer, 2001

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Totals
1. Responds	#	89	58	30	4	12	193
	%	*46*	*30*	*16*	*2*	*6*	*
2. Helpful	#	86	60	23	10	13	192
	%	*45*	*31*	*12*	*5*	*7*	*
3. Comfortable	#	105	39	34	8	7	193
	%	*54*	*20*	*18*	*4*	*4*	*
4. Recommend	#	101	42	23	11	14	192
	%	*53*	*22*	*12*	*6*	*7*	*
5. Communication	#	98	57	22	9	8	194
	%	*51*	*29*	*11*	*5*	*4*	*

Combining responses of "Strongly Agree" and "Agree" to indicate positive response to any individual item, the positive trend on each of the five items was: 76 percent for Item 1; 76 percent for Item 2; 74 percent for Item 3; 75 percent for Item 4; and 80 percent for Item 5.

A further measure of the mentor program's effectiveness came from actual student performance data. Among Florida State's concerns in implementing online degree programs were student retention rates and student success rates. National reports placed the retention rate for online college courses as low as 68 percent (DeFranco & Wall, 2001). Over the first four semesters of the Florida State program (Fall, 1999–Fall, 2000), using the mentor model, undergraduate retention was 87 percent. Over that same period, student success, defined as students who persisted to the end of the online course and earned a grade of C- or better, was 85 percent.

CONCLUSIONS

One of the conclusions drawn by the university related to the way the mentor model permits scalability. By adding another mentor/section for every 20-25 students, course caps could be set at virtually any level desired by the faculty member. In one project, when course enrollment was projected to be as high as 400 students, an extra organizational layer of online support faculty was interposed between the lead professor and the mentors, to keep the span of control within accepted manageable limits (Garvey, 1997).

The students in the Florida State program tended to be non-traditional college students, but quite "traditional," in terms of the expected audience for distance learning degree programs. This means that they were typically employed full-time, place-bound and unable to attend face-to-face courses, with varying levels of computer skill. This made the mentoring function especially important, as Naisbitt (1982) described it, providing the high-touch to balance the high-tech. He suggested that as the level of technology increased, so would the need for human contact in the technical environment. This has been borne out by the student response information presented previously.

Taken together, these two points suggest that online students engage in the behaviors of informed consumers. This has been found to be the case with the Florida State program in which initial student inquiries are in the manner of "degree shopping." As Seeheusen (2000) wrote, "Online students, dissatisfied with the student or instructional services they receive, can simply enroll in another college by logging onto its Website" (p. 36). This means that extra efforts to retain students and shepherd them to success, as the Florida State mentor model strives to do, may be even more important in the virtual campus than on the physical one.

Mentor support was shown to play a dual role, supporting faculty as well as students. By providing an extra level of faculty support to handle the increased message traffic associated with distance learning (Chute et al., 1999), the Florida State mentors were able to help students understand the course Website and the content it contained.

Dealing with the medium was every bit as challenging as the coursework for new distance learning students. The mentors reported dealing with both issues in the early weeks of courses, at times between 10 and 15 hours per week. This was a level of individual attention that might not have been possible for an instructor, especially if he or she had responsibilities for other face-to-face classes in the same term.

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ONLINE INTERACTION: LEARNING COMMUNITIES IN THE VIRTUAL CLASSROOM

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INTRODUCTION

The Evolution of Distance Learning

In its infancy, distance learning was synonymous with correspondence. Students completed assignments, submitted them through the postal service and awaited their return. As technologies developed, some distance learning efforts moved to include videotaped lectures or phone conversations between individual students and instructors. In the late years of the 20th century, many universities and colleges began to offer distance learning courses over cable television channels (Kerka, 1996). Recently, the term distance learning has come to refer almost exclusively to courses offered over the Internet, using email and web technologies to connect learners and teachers.

Much like other modes of distance learning, online learning emerged through a complex set of perceptions, assumptions, and societal shifts. Perhaps the most formative of these is the demographic shift witnessed in American higher education in the late 1990s and into the 21st Century (Hammonds et al., 1997). Students are increasingly of a so-called nontraditional background, coming from the workforce or the home into college or returning to school after a long hiatus. Twigg (1994) estimates that a full seventy-five percent of college students fit this nontraditional definition either by age or by part

time status. Community colleges, whose students have long been defined as nontraditional, have seen a dramatic shift in almost every demographic measure of the student population. Further, the nature of this shift--from high residency, full time, young students to commuter, part time, older students--has prompted schools to rethink their organizational structure and course offerings.

Changes in Use of the Internet

The use of the Internet as a delivery mode has also changed as technologies have evolved. Just as early correspondence courses progressed to make use of video technologies, modern offerings have very rapidly evolved from what were essentially digitally transmitted correspondence courses to courses and programs that are "getting people--and often video images of people--into the same electronic space so they can help one another learn" (Filipiczak 1995, p, 111).

Gone is the emphasis on self paced courses and isolated learners and teachers. Digital communication has afforded educators the opportunity to rebuild distance learning curriculums to include true collaboration and interaction among learners, teachers, and subject area experts. In fact, the possibilities created by the inclusion of digital communication in distance learning offerings is beginning to provide educators with a new palette from which to design course offerings and degree programs. The online forum provides new and unique ways to address old educational issues. Addressing those issues, however, requires that educators begin to look at Internet-based learning from a new perspective. They must move beyond the traditional concepts of distance learning in order to take advantage of the many opportunities of the online world.

Specifically, educators need to see the Internet not as the "Information Superhighway" it has been sold as, but

as a space, albeit digital, where meaningful work and community building can take place. Only by making active use of the available technology can online learning truly become more than a second rate stand in for traditional face-to-face learning scenarios.

Changes in Students and Institutions

While early online offerings were little more than the digital distribution of printed course materials through electronic mail and Internet postings, emerging consumer technologies are supporting a strong core of online educators who are making innovative, constructive use of the digital realm. The appearance and proliferation of digital communication technologies has enabled educators and students to create online learning communities where truly interactive and challenging academic work can take place. For distance learning to effectively achieve the goals of a learner-centered, constructivist education, educators must make use of the vast potential of all types of digital communication in their course design and implementation.

However, more than just the technologies have changed. Bates (1995) points out that traditional correspondence students were physically isolated adults for whom distance learning was the only educational option. The current distance learning population can include anyone (Kerka, 1996), and many argue that the term distance learning is a misrepresentation of the situation. In the State of Washington, for example, over 80% of distance learning students in the community college system are also taking courses on the campus that offers the distance learning option. For these students, online learning is a scheduling option not unlike an evening or weekend course; it offers greater flexibility in their daily lives.

While many institutions of higher learning are cautiously entering the digital realm, the majority have at

least some investment in computer-assisted learning and online distance learning. Many institutions have invested heavily in the computer infrastructure and professional development necessary to offer a significant number of courses and even complete degree programs online. This is yet another change in the distance learning landscape, as correspondence offerings were scattered among a very few institutions and were not comprehensive.

Changes in Online Social Environment

As computer mediated instruction and distance learning grew in the late years of the 20th century, the technology dominated the landscape. Educators looked to the machines and networks as the foundation for course designs (White & Weight, 2000). Courses were designed for efficiency and technology rather than for learners. Entire courses and programs have been developed in a way that allows an instructor to create a course once and thereafter let it run itself in the online environment. Students come to the classroom, cycle through its various tasks and assessments, and leave. However, researchers have observed that online learning environments in fact create new social situations (Sproull & Kiesler, 1991). It follows that educators make use of these new social dynamics in their course design. Ignoring the social and community-building aspects of online learning is to deny a significant and meaningful learning opportunity.

THE ONLINE LEARNING COMMUNITY

Palloff and Pratt (1999) suggest that the best model for an online course offering is one in which active learning is the dominant mode of learning. Learners are often left up to their own devices to make sense of the course information, and since they are often physically removed

from the instructor and from other learners, they take this as a natural part of the online learning environment. *But a major component of active learning involves collaboration and communication with both peers and instructors.* An online learning community allows for such contact to take place. Schutte (1996) attributes much of the success of online learners to the amount of community and connectivity they experience. As researchers begin to measure the effectiveness of distance learning offerings, Schutte believes that community and collaboration will emerge as important variables in the experience. Howard-Vital and Nottingham (2001) point out that social learning involves the exchange, discussion, interpretation and critique of information, which is easily observed in online discussion forums and chat rooms.

Chute, Sayers, and Gardner (1997) present a model for the distance learning environment that places the learner in the center of a web of communication possibilities. From this position the students are seen to have digital connections with other learners, the instructor or moderator of the class, campus and community support services, subject area experts, Internet resources, and virtual library databases. This learner-centered approach to leveraging the power of the Internet for classroom use leads one to see the vast potential that grows from the online environment.

While it is difficult to make active use of the above resources in a traditional face-to-face class, they become the dominant mode of design and implementation in the online classroom. Because it is very difficult for an instructor to have contact with all students at the same time in a distance learning environment, he or she is apt to direct and guide the students toward the learning experience, thereby creating a more constructivist approach to learning.

Asynchronous Communication Technologies

The most common communication modalities in online learning are asynchronous in nature. Threaded discussions, message boards, and email dominate the landscape. These modes of communication provide learners the opportunity to communicate reflectively and with access to resources and course materials. For example, a student responding to a question from the instructor on a message board has time to reference her textbook or notes and provide citations to support her response. The best use of asynchronous discussions is for basic material and material that requires lengthy, thoughtful responses.

Eastmond (1995) points out that asynchronous, computer-based discussions allow students to develop skills in locating and accessing information and in soliciting help and input from peers and experts in the field. Students in the online environment feel that they have increased connection with their classmates and instructors because their interactions are not limited to the classroom or the instructor's office.

The Shift to Include Synchronous Communication

> Internet-based "chat" and messaging applications, in conjunction with the increasing availability of "always on" Internet services have changed the way people communicate in the online world. Electronic mail, still apparently the number one use of the Internet among Americans, appears to be becoming challenged by instant messaging and chat programs that allow users to communicate through voice, video, and text in real time.

These synchronous communication technologies allow live, interactive communication among learners, teachers, and subject-area experts in ways not possible in

either the face-to-face classroom or the online classroom that rely solely on asynchronous communications. Perhaps more importantly, synchronous communication allows instructors and students to see one another as multidimensional personalities rather than being represented by their assignments and assessments. This personalization of the learning environment is one of the keys to a successful course. The move to synchronous communication as a significant part of the online learning experience also helps the classroom manage itself, and may possibly lead to increased retention and completion of online courses.

Given current technologies, chat rooms are a key component in a cooperative online environment. Chat rooms allow a teacher to interact with a large number of students at one time, provide a space for collaborative work to develop and create a forum for deep-level questioning of advanced topics. Asynchronous exchanges can develop quite slowly over hours or even days, thereby taking the "teaching moment" away from the experience, but chat rooms allow for instant feedback and response. Redirection, assisted exploration and corrective feedback are more easily presented in chat rooms than through other forms of online communication.

The Role of Faculty

The role of faculty in online distance learning represents a shift from the traditional. Indeed, the emphasis in the literature is often on the role of the instructor in designing and moderating a course that runs independent of the students enrolled in the class. In an online learning community, the instructor is not merely the source of content knowledge, but is also the guide to the learning environment, the moderator of online discussions, and an active learner.

Howard-Vital and Nottingham (2001) provide an excellent summary of the faculty role in the online learning community; "Since it is no longer necessary for faculty to be the sole source of knowledge or content for students, it is the responsibility of faculty to focus on the learning process" (p.74). In addition, faculty can "employ a range of communication technologies to help students discover how they learn best" (p. 74).

Palloff and Pratt (1999) describe the faculty role as a complex combination of facilitator, cheerleader, organizer, and imparter of information. Additionally, they relay the need for instructors to be aware of the dangers of the online interaction. Silent students can very easily remain silent, dominant voices can grow overbearing, and discussion forums can promote a sort of "group think" that negates the benefit of an online community.

Most importantly, as course designers, instructors are responsible for creating opportunities for community to develop. Online chat, discussion forums, email, and collaborative activities need to be natural parts of the online classroom experience. To do this, faculty need to be aware of learning styles of their students and how various instructional technologies can enhance or deter those learning styles. The online classroom cannot be "a finite environment in which the teacher closes the door and controls the flow of information" (Howard-Vital & Nottingham 2001, p. 74).

The Role of Technology

While educators are reluctant to personify machines, it is clear that the computer systems used in distance learning are indeed members of the learning community. And as artificial intelligence (AI) becomes more and more accessible to consumers, the "human" role of computers in teaching and learning will undoubtedly increase.

Sherry Turkle (1995) says:

> on the one hand we insist that we are different from machines because we have emotions, bodies, and an intellect that cannot be captured in rules, but on the other we play with computer programs that we think of as alive or almost alive. (p. 177).

This points to an important consideration in thinking about the role computers play in the learning community. Students interact with their machines more than they do directly with other people. Modern computer software is designed to be interactive and personal. Many users name their computers, and affordable consumer voice-recognition software enables computers to respond to basic voice commands. Apple Computer's Speech Recognition program, for example, is included on every computer they sell and uses the computer's "name" as a cue to respond and perform a function.

On an educational level, students will often turn to their computers--and the networks to which they are connected--for answers to content-level questions. Rather than soliciting help from a teacher or a classmate, the first step for many students is often to search an online database for help or an answer to a simple question. Again, one can see the computer as a member of the learning community and not simply a machine that performs functions.

Computers also play an important role in enabling community itself. First, the networks on which online courses are held provide the virtual space for interaction and collaboration to take place. As a replacement for the more traditional classroom, the computer networks become the place where students meet, interact, and share information. The network also often supplants librarians

and other experts, replacing them with online databases and information forums.

But can computers play a more active role in helping form and support online community? Janet Ward Schofield (1995) documents the effect of computer-based tutors in the classroom. These tutors are based in current artificial intelligence technology and ideally "are designed to follow what a student is trying to do, diagnose the difficulties the student is experiencing, and present instruction relevant to those difficulties" (p. 21). One can see how such a tutor could easily be an element of an online learning community. Schofield is quick to point out that any teacher implementing artificial intelligence tutors in the classroom must make adjustments in curriculum, assessment, and interaction to account for the new member of the class.

Other Aspects of Online Communities

In designing, preparing for, and experiencing online communities, participants must also account for the various positive and negative aspects that real and virtual community presents. Palloff and Pratt (1999) suggest that ritual, spirituality, and psychological issues become necessary and sometimes difficult to manage elements of online learning communities.

Ritual is an important piece of any community or culture, and there is no reason to believe that it should not or will not be equally important in a virtual world. Students will often develop their own rituals in an online world by adhering to certain etiquette in discussion forums or initiating one another in the online world.

Similarly, the spiritual nature of society finds its way into online community. Students will often discuss spiritual issues, seek out others with similar spiritual backgrounds,

or base their reactions to course material in their own spirituality (December, 1997).

Psychologically, it is important for instructors to realize that people seek connection, friendships, and community in all environments they are in, including the virtual environments of online learning (Shaffer & Anudsen 1993). Despite the inherently isolative tendencies of personal computers, people tend to seek connections through the machines that isolate them. Again, allowing for and even facilitating such connections can help foster online community and create an environment conducive to deep thinking and active learning.

Ethics, rules, and standards also make their way into any discussion of community. The sense of anonymity online interaction creates can lead users to alter their normal public behavior and sometimes act in inappropriate ways. Illegal uses of computer networks, invasion of privacy, and even threatening behavior have all been documented in online college courses (McDonald, 1997). Instructors may have to provide for their students some training and education on acceptable online behavior, privacy rules, and other issues that may arise in this area.

CONCLUSIONS

Creating and promoting online community can enhance the learning experience of students, open doors for educational possibilities that did not previously exist, and promote active, constructivist learning. The online environment can become a place where meaningful, active learning can take place. Faculty, students, and the technologies involved in the online community all play an important role in this process. With the creation of community also comes the potentially negative aspects of collaboration and connectivity. Educators can craft these elements into online learning environments that are more

than second-rate replacements for the traditional learning experience, but this requires an approach to course design and teaching methods that is a major deviation from the traditional norm and even very recent computer-assisted learning practices. Critical in this shift is an assessment of how learner, teacher and technology interact as members of the learning community.

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